NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

STATISTICALLY DERIVED SYSTEM RELATIONSHIP
MODELS FOR THE SASSY MANAGEMENT UNIT
1ST FORCE SERVICE SUPPORT GROUP,
CAMP PENDLETON, CALIFORNIA

by

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June 1981

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and predict.

The utility of this thesis lies in its application at both local and higer organizational levels for funding and management decisions. The quantification of the SASSY relationships is especially useful when auditing SASSY operations as deviations from historical patterns are immediately evident. The ability to predict future values with equations making use of time-lagged data gives the using manager a greater flexibility in his operations, and will tend to bring the higher and lower organizational levels of management into a more common understanding of the problems faced by the SASSY Management Unit, thus providing greater structure to the decision making process.

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Statisitcally Derived System Relationship Models for the SASSY Management Unit, 1st Force Service Support Group, Camp Pendleton, California

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This Thesis develops thirty-one models defining various Supported Activity Supply System (SASSY) relationships as seen from the perspective of the SASSY Management Unit. Multiple linear regression combined with time series analysis is used on data drawn from the SASSY Management Unit at Camp Pendleton, California. Two years of data are used in developing the models which are then tested against five months of actual data to determine their abilities to describe and predict.

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problems faced by the SASSY Management Unit, thus providing greater structure to the decision making process.

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I. INTRODUCTION

A. GENERAL

The Supported Activity Supply System (SASSY) is the general supply system providing supply support to the operating forces of the United States Marine Corps. It is an automated system which interfaces with the Marine Integrated Maintenance Management System (MIMMS) and the Marine Air-Ground Financial Accounting and Reporting System (MAGFARS). The three systems are so interconnected that the opening up of an Equipment Repair Order in MIMMS showing a need for a repair part will automatically put that part on order in SASSY and then report the financial obligation of Requisition Authority (RA) monies in MAGFARS. SASSY is a major system which can readily be seen in that the aviation, ground, combat, combat support and combat service support communities within the Marine Corps draw upon SASSY for their non-aviation logistics support.

Central to the control and management of SASSY operations is the SASSY Management Unit (SMU) located within each of the four Force Service Support Groups and the 1st Marine Brigade in Hawaii. It is here in the SMU's that the

decisions are made which impact on the depth and breadth of supply support provided to the Fleet Marine Forces (FMF's). Since its introduction, SASSY has evolved over the years into a tremendously complicated system. Because of this complexity, the greatest hope in understanding SASSY and in describing the relationships and correlations within the system, taking into account the various time lags and changes over time, comes from an examinaton of the budget process in the Marine Corps with an emphasis on the SASSY/MIMMS/MAGFARS interfaces supported by a statistical description of the operation of one of the SMU's. It is believed that the Officer-in-Charge (OIC) of an SMU would be better prepared to make the daily management decisions which directly affect the quality of support provided to the operating forces, if he were aware of the system relationships.

B. SUPPORTED ACTIVITY SUPPLY SYSTEM (SASSY)

The Supported Activity Supply System (SASSY) is a centralized Marine Corps-wide logistics system which serves to provide support to the operating units of the Fleet Marine Forces (FMF). Typically, one SASSY Management Unit (SMU) supports one Marine Amphibious Force (MAF) composed

typically of one Marine Division, one Marine Air Wing, and one Force Service Support Group. There are three active Marine Divisions, three active Marine Air Wings, three active Force Service Support Groups, and in the Reserve establishment there is one Marine Division, one Marine Air Wing and one Force Service Support Group. Atypically, there is a a fifth SASSY Management Unit supporting the 1st Marine Amphibious Brigade located in Hawaii.

Geography plays an important part in determining which SASSY Management Unit supports which forces:

1. Pacific Forces, Fleet Marine Force, Pacific

a. Western Pacific Forces, FMFPac--Supported by the SASSY Management Unit with 3rd Force Service Support Group, Okinawa, Japan.

b. Eastern Pacific Forces, FMFPac--Supported by the SASSY Management Unit with 1st Force Service Support Group located at Camp Pendleton, California.

2. Atlantic Forces, FMFLant--Supported by the SASSY Management Unit with 2nd Force Service Support Group, Camp Lejeune, North Carolina.

3. 1st Marine Brigade-- The 1st Marine Brigade, located in Hawaii, has its own smaller SASSY Management Unit because of its location apart from other Marine forces and logistics centers.

4. Marine Reserve Forces-- Marine Reserve Forces located throughout the United States are supported by the SASSY Management Unit located with elements of the 4th Force Service Support Group.

SASSY draws its supplies and various stock from the various Department of Defense "item managers" and the two Marine Corps Logistics Support Bases at Barstow, California and Albany, Georgia. There are basically two ways in which the SASSY Management Units receive materials and supplies for future issue to their customers:

Material is "pushed" to it, purchased at the Headquarters, Marine Corps, level, for the Appropriated Stores Account (ASA). These materials are free of charge to the General Account of the SASSY Management Unit and will be issued, in turn, free of charge to the SASSY Management Unit's customers. Such items cannot be bought by the customer as they are controlled and reportable as Table of

Equipment (T/E) items managed at the Headquarters, Marine Corps, level. They tend to be the larger end items or separately managed combat essential items such as rolling stock, tanks, radio and other communications equipments, artillery pieces, etc. SASSY deals mainly in those items which are consumables, repair parts and organic supply items. It would be possible, for instance, to requisition a screw for a truck engine, or the entire engine, as both are items purchasable with Requisition Authority (RA) dollars through the SASSY Management Unit. Requisition Authority funding will be discussed later in greater detail.

Material is "pulled" to the General Account by means of the SASSY Management Unit passing on customer requisitions or by the SASSY Management Unit making stock purchases from the two Marine Corps Logistics Support Bases or item managers.

C. SUPPLY POLICY IN THE MARINE CORPS

SASSY is a Class I, Headquarters, Marine Corps, managed system.[1] Field activities, such as the SASSY Management

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[1] Class I computer software programs may not be altered in any fashion by other than the program sponsor under approval from Headquarters, Marine Corps. Lesser class systems software, depending upon the classification, may be modified to meet local needs.

Units are strictly enjoined from making any changes to the SASSY software and procedures. As SASSY interfaces directly with MIMMS and MAGFARS, a local well-intentioned change could have disasterous and far-reaching results, not only in other portions of SASSY but also in the other two interfaced systems.

SASSY is standardized for all Fleet Marine Force units in all places and is automated to the extent that much of the manual bookkeeping and interface between SASSY and MIMMS and MAGFARS is automatic and accomplished through a system of grandfather-father-son master tapes maintained current through a routine series of updates. It is routine, therefore, to enter data only once into either SASSY or MIMMS and have it "hit" in all three systems. SASSY is responsive to the needs of the customer in that the Headquarters, Marine Corps, goal is 75% for meeting demands for Requisition Objective (RO) items off the shelf out of locally held stock. "Mount-out" supply packages, drawn for and sent with deploying units in case of future need, are drawn from the SASSY Management Unit's General Account even though such a large drawing has significant impact on the shelf stock remaining and available for issue to the other non-deployed customers. Funding for supply support is from

two "fenced" and separate classifications of monies, Requisition Authority (RA) dollars, and Planning Estimate or Operating Budget (PE/OPBUD) dollars.

D. BUDGETING AS IT AFFECTS SASSY

1. General

In order to understand the budget constraints on the SASSY Management Unit and its customers, one needs a working knowledge of the budgetary process in the Marine Corps. Specifically important to SASSY is the way that budgeting is done in the Fleet Marine Forces (FMF's) all the way from the FMF Headquarters down to the individual customer cost centers. By way of introduction, the Marine Corps operates under two budgeting systems: Planning, Programming and Budgeting System (PPBS) introduced to the Department of Defense in 1963 under then Secretary of Defense McNamara; and Zero-Base Budgeting (ZBB) introduced to the Federal Government by President Carter on February 14, 1977. It is noted, however, that ZBB was begun in the Marine Corps before President Carter was even elected. The basic guidelines to be followed are contained in Office of Management and the Budget (OMB) Bulletin No. 7709, Zero-Base Budgeting. Regardless of the budgeting approach currently

in vogue, one basic tenet of the financial management philosophy in the Marine Corps which stands the test of time is that "financial management is inherent in command."[2] Commanders' prerogatives are closely linked to their financial plans. In a "bottom up" process, they develop their schedules of operations and budgets in accordance with budget guidance provided to them by a succession of higher headquarters. Thus, Marine commanders have a large input to their budgets and ultimately are required to live within those same budgets. Each successively higher commander, recognizing the fixed dollar limitations and categories within the scope of the language of legislative appropriations and Sections 3678 and 3679, Revised Statutes, U. S. Code, plans for tight financial controls to be levied on his subordinate commanders.[3] "Essential to effective budgeting is the principle that the lines of budget submission and approval must follow the lines of organizational responsibility, both within the organization and in the external chain of command."[4]

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[2] Department of the Navy, Headquarters United States Marine Corps, Financial Guidebook for Commanders NAVMC 2664, 30 June 1976, p.1

[3] Naval Postgraduate School, Practical Comptrollership, Second Edition, p.203

[4] Ibid., p.203

2. Marine Corps Appropriations

Strictly speaking, there are only three direct Marine Corps appropriations that affect the Marine Corps SASSY Management Units:[5]

- •Military Personnel, Marine Corps (MP,MC)
- •Procurement, Marine Corps (P,MC)
- •Operations and Maintenance, Marine Corps (O&M,MC)

Note that only O&M,MC funds impact on the SASSY Management Unit and its General Account. Whereas budgeting is "bottom up", appropriations and authorizations are "top down". The Congress authorizes and then appropriates funds, the Office of Management and the Budget (OMB) apportions those funds and eventually the Commandant of the Marine Corps receives funds which he may then pass to his Fleet Marine Force commanders, Commanding Generals FMFPac and FMFLant. The funds are passed in the form of Operating Budgets (OPBUDS). Note that FMFPac and FMFLant cannot delegate their Section 3678 and 3679, Revised Statutes, U. S. Code,

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[5] The Congress appropriates in a total of ten categories of funds for the military departments. Because of the United States Marine Corps being a part of the Department of the Navy, and the Navy being responsible for the funding of various services for the Marine Corps such as Medical, Dental and aviation assets, the legislative language of the appropriations bills for Operations and Maintenance, Navy (O&M,N) and Other Procurement, Navy (OP,N) includes specifying that some of the funds are to be used to support the Marine Corps.

responsibilities to not over-obligate or spend appropriated funds for purposes other than specified in the appropriations bills.[6] The two OPBUD Holders, in turn, delegate authority to obligate OPBUD funds to their subordinate commanders by means of a Planning Estimate (PE). Planning Estimate Holders further pass funds to their Cost Centers. In the Fleet Marine Force this generally means that Battalion sized ground units and Aircraft Group sized aviation units are designated cost centers.

3. FMF Budgeting

In the Fleet Marine Force, zero base budgeting begins at the cost center level for all Operations and Maintenance, Marine Corps, funds. It is at this level that the future demands on SASSY are first estimated. A budget is prepared by each cost center and forwarded to the Planning Estimate Holder who, in turn, aggregates the budgets of his Cost Centers and forwards the total command's budget to the OPBUD Holder. This way, the grand aggregate is for the Marine Corps as a whole.

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[6] Sections 3678 and 3679, Revised Statutes, U. S. Code, are amendments to the Anti-Deficiency Act of 1906. Section 3678 refers to the intent of Congress and prohibits the expenditure of funds for purposes other than for which those funds were appropriated. Section 3679 refers to the legal requirements and constraints against over-obligating appropriated funds.

4. <u>MAGFARS</u>

Even with zero base budgeting, there is a requirement for historical cost data from which to project future costs. MAGFARS is the automated financial accounting system which accumulates, records and reports those historical costs. Remember, earlier in this Chapter, MAGFARS was one of the automated systems interfacing directly with SASSY and MIMMS. MAGFARS aids financial control through financial accounting and reporting to the various FMF commanders by providing them with accounting reports which detail the obligation and expenditure of their O&M,MC funds.

5. <u>Requisition Authority Versus Operating Budget Dollars</u>

The FMF commander's budget is composed of both Requisition Authority (RA) dollars and Operating Budget/Planning Estimate (OPBUD/PE) dollars. In financial management and supply parlance, the OPBUD/PE dollars are "hard" dollars whereas the RA dollars are "soft" dollars which may only be spent at the local SASSY Management Unit supporting that command.

The OPBUD/PE dollars may be spent outside of the Marine Corps Supply System, i.e., outside of SASSY and the Direct Stock Support Centers.[7]

There is a one to one mapping ratio between every RA dollar passed to an FMF commander and the equivalent OPBUD dollar provided to the local SASSY Management Unit to support the future buys from that commander. The Officer-in-Charge (OIC) of the SASSY Management Unit is responsible for purchasing items from his sources of supply so to maintain stock levels on hand in anticipation of requisitions from customers who have matching RA dollars for his OPBUD dollars. In order to maximize the potential for achieving economies for scale, and to maintain control over the classes of items purchased by commanders, it is a routine control measure to issue the vast majority of funds to commanders with RA "fences" around them, thus ensuring that if spent, the funds can only be spent at the SASSY Management Units for standardized, approved supplies and equipments. Typically, a commander may receive, at the most, only 25 per cent of his total budget in OPBUD/PE dollars; the vast majority of his funding, therefore, is RA

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[7] The OPBUD/PE "hard" money is directly transferrable to civilian vendors by the issuance of government checks.

which passes through the SASSY Management Unit. This creates a tremendous captive audience for the SASSY Management Unit because the customers lack the appropriate funding to procure their supplies and equipments elsewhere. The small portion of the budget designated as OPBUD/PE dollars are normally spent in the procurement of certain classes of supplies such as petroleum and "self-service" type items carried at the local Direct Support Stock Control (DSSC) centers. If these "self-service" centers cannot support the commander's requirements and he has the funds, he then has the option of going "open purchase" to a civilian vendor for what he needs. It benefits the commander to be able to obtain the items he needs through the SASSY Management Unit because he pays a considerably lower price than if he were to go outside the Marine Corps Supply System. Going through SASSY also simplifies the commander's record keeping.

E. OBJECTIVES AND SCOPE

1. Objectives

The objectives of this thesis are to examine, correlate and quantify, where possible, the system relationships in SASSY in such a way as to develop a decision support system (DSS) for use by the Officers-in-

Charge (OIC's) of the SASSY Management Units that are supporting the operating forces of the Marine Corps. Because SASSY data will be sampled for statistical analysis, field data will be allowed to speak for themselves. The objectives lie in virgin territory because the exact relationships of variables in SASSY, as practiced by the SASSY Management Units, are generally unknown, though there are a considerable number of rules of thumb which are used daily by the practitioners. Inherent in a good decision support system (DSS) is the ability to predict future events, volume of business, inventory and financial positions, etc., to a degree of accuracy which makes the predictions of use to the manager.

2. Scope

The scope of this thesis, because of the enormity of the SASSY system, is limited to the SASSY Management Unit of the 1st Force Service Support Group at Camp Pendleton, California. The raw data sampled will be those pertaining to the Camp Pendleton SASSY Management Unit's operations during Fiscal Years 79 and 81. These data will be used in the attempt to predict the first months of FY81.

F. METHODOLOGY

The complexity of the SASSY system as it applies to the Camp Pendleton SASSY Management Unit dictates a rigorous research methodology if the conclusions drawn as a result of the thesis effort are to be believable. The conduct of the research will follow the basic pattern outlined below:

1. Preliminary Review of Marine Corps Literature

Preliminary review of "in-house" Marine Corps literature concerning SASSY Management Unit problems and operations will be conducted to determine if there are problems resulting from SASSY Management Unit Officers-in-Charge not knowing the SASSY system relationships as they apply to their SASSY Management Unit under field conditions.

2. Definition of the Problem

Definition of the problem will include setting boundaries and limits. The research problem will be further refined into specific research questions.

3. Development of a Hypothesis

The initial hypothesis will be that there are in fact quantifiable relationships between various important SASSY variables as viewed from the SASSY Management Unit OIC's position.

At this point, the hypothesis is not yet supported by empirical data, but will serve as a guide to

a. Search for data which must be collected in order to answer the research questions.

b. Indicate an effective and efficient way in which the data can be collected and organized so as to be tractable in future analysis.

c. Provide a basis for selection of analytical techniques and methods which might be employed against the data to test the research questions and the hypothesis. Whether or not the nature of the anticipated system relationships can be stated in quantifiable terms is not determinable at the outset of the research. In either case, it will be of benefit to the OIC of the SASSY Management Unit to know whether he is working with quantifiable relationships. It is possible that the outcome of this thesis will be the development of a more advanced hypothesis, having eliminated the current one from consideration. The guiding principle throughout is that the formulation and verification of the hypothesis is a major goal of scientific inquiry.

4. Research Subtasks

The research task will be reduced to a manageable size and then further divided into subtasks so that the effort will remain within the scope of this thesis.

5. Definition of Concepts

It is anticipated that many of the concepts will be working definitions of systems relationships which are to be proved. Throughout this thesis, there will be a concern for the ability to generalize the findings to the overall hypothesis.

6. Research Design

Research design, "the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with ecomomy in procedures", is considered extremely important in keeping this thesis within the resources available to the thesis writer.[8]

a. Formulative/exploratory studies are anticipated in the search for variables with predictive power with respect to other variables. Such studies have the purpose of helping to reformulate the problem statement for more

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[8] Sellitz, C., and others, Research Methods in Social Relations, Holt, Rinehart and Winston, 1959, p.50.

precise investigation, with a spin-off benefit of increasing the thesis writer's familiarity with the system he wishes to investigate. This exploratory step is the foundation of the research process for it sets the direction for subsequent work within the scope of the thesis. "In practice, the most difficult portion of an inquiry is its initiation."[9] There remains a difficulty in knowing what questions to ask, which variables to evaluate for predictive power, causality and correlation; exploratory studies will serve to narrow the field of potential questions.

b. Review of the literature, though one of the simplest and most economical methods of starting an inquiry, is not expected to be fruitful in illuminating SASSY relationships because so little has been written which is more than memorandums, point papers and messages concerning day-to-day operation problems. These materials will be reviewed with a special sensitivity to the hypothesis and research questions which may be derived from them. In the case of selecting analytical techniques and research approaches, the literature is especially ripe with quality works. The major areas of review will be in financial

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[9] Ibid., p.52

control systems, decision support systems and statistical techniques.

c. No particular effort will be made on a bibliographical survey as it would undoubtedly be more time consuming than rewarding. It is anticipated that various bibliographies will be consulted during the search for appropriate techniques; however, there is no intent to conduct a formal bibliographical survey.

7. The Sample

The sample will be limited by what data have been retained by the SASSY Management Unit, 1st Force Service Support Group at Camp Pendleton. Because of the general lack of long term historical data, it may be possible to obtain only monthly data for two or three years. Some of the data may be able to be reconstructed from files and other retained reports should it otherwise not be available. It is further anticipated that much of the data will be in summary form and that one of the problems will be in validating summary and tabulation efforts made by the SASSY Management Unit in recording and reporting the data. This sampling limitation is not considered restrictive as the SASSY system is dynamic and constantly evolving and relationships changing as new programs and equipments are

introduced; thus, the old data which is expected to be unavailable should not be considered as significant. It is important to note that the SASSY system went into a new "stratified buy" posture prior to FY 79; therefore, only that data from FY 79 onward would be expected to be of use in determining current relationships.[10]

8. Data Collection

Design of the data collection effort is to obtain financial and supply/inventory data in as many categories (variables) as possible which appear to measure the level and tempo of logistics operations. Interviews with the OIC, SASSY Management Unit at Camp Pendleton, have indicated specific data believed to be of special importance. Part of the preliminary formulative/exploratory studies effort will be attempting to determine the variables for analysis. It is anticipated that data collection and statistical analysis will be an iterative process and that once certain system relationships are determined, they will suggest other data for analysis.

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[10] The stratified buy posture is a system of computer generated buy recommendations based upon usage data for each line item. The stratified buy posture resulted from a Headquarters, Marine Corps, directed purchasing algorithm which generated greater buys in the lower-priced stock in an effort to reduce the cost of carrying inventory.

9. Statistical Analysis

Statistical analyses of various sorts have tremendous appeal because of the complexity of the SASSY system and the volume of business done by the SASSY Management Unit. The technique, which at the outset seems to have the greatest potential, is the descriptive and predictive approach of regression analysis. It is anticipated that time series analysis will be required to handle the time lag questions in SASSY, but variables can be lagged using proprietary statistical software programs. Once a general description of the SASSY Management Unit has been developed, the emphasis will be shifted to determine reliable and useful predictors with application to general SASSY Management Unit operations. The problems of measurement of performance will be addressed with an emphasis on fill rates and what one gets for the millions of dollars spent. The overall statistical approach is to follow "shot-gun" procedures and to let the data speak for themselves and to acknowledge where the results are inconclusive and not supported by data.

The statistical analysis to be conducted is expected to describe system parameters and relationships of variables. Currently, there is no documented research in

this area of SASSY. This thesis is intended to provide the OIC, SASSY Management Unit with guidelines concerning what he should spend his money for, in what amounts, and what he should get for it in terms of fill rates. It is strongly believed that should the hypothesis proposed be validated, this thesis will be of significant use in planning and budgeting a multi-million dollar supply account, and will show a methodology that would be directly applicable to the other SASSY Management Units in the Marine Corps Supply System.

G. THESIS ORGANIZATION

•Chapter I presented general objectives of the thesis and an overview of the environment in which the research is to take place.

•Chapter II presents the detailed design of the research and data collection efforts outlined briefly in Chapter I. Also covered in detail are the philosophies regarding the structure and format desired for the output of the research.

•Chapter III presents the modelling efforts, philosophies and a preliminary look at the data upon which the models are based.

•Chapter IV presents the detailed statistical analysis used in building the model. It is included as a chapter in order that those attempting to use the models may see how they were developed statistically.

•Chapter V is dedicated to testing the various models developed in chapter IV. The data is put into the models and the predictions are compared against the actual values for those variables drawn from the first months of FY 81.

•Chapter VI presents recommendations for the use of the models developed in Chapter IV and tested in Chapter V.

•Chapter VII documents the "technology transfer" plan and the transfer efforts made during the research phase and refers to an appendix with "how to" instructions for using the programs written for the Texas Instrument TI-59 programmable calculator to aid the OIC, SASSY Management Unit in the use of the equations derived statistically from the data.

•Chapter VIII presents the conclusions drawn from the whole study and provides comments and recommendations concerning the general applicability of the findings concerning SASSY.

II. RESEARCH DESIGN

A. REVIEW OF IN-HOUSE MARINE CORPS LITERATURE

The review of memorandums, speedletters, point papers and other documents started with liaison visits to the principal players at 1st Force Service Support Group, Camp Pendleton, California. The first persons contacted were the Commanding Officer, 1st Force Service Support Group and his Chief of Staff. They made the appropriate arrangements for the Command's files and records to be made available to include supply and fiscal data as well as correspondence concerning the General Account of the SASSY Management Unit. The search for correspondence started with visits to officers of special importance on the General Staff; they were helpful but had little to provide that could not be provided in greater detail by the SASSY Management Unit. In fact, it was determined that the Officer-in-Charge of the SASSY Management Unit was their source of information. From that point on, the main points of contact were the officers at the SASSY Management Unit. To obtain a different perspective, that of the OPBUD Holder, personal interviews were conducted with FMFPac and FMFLant Comptrollers. Each

provided insight into the planning for SASSY Management Unit operations that takes place at the highest operational levels. It was here that the importance of being able to predict Requisition Objective (RO) Fill Rates became known. The RO Fill Rate is used in financial management planning and budgeting at the FMFLant and FMFPac level. At FMFPac, the budgeting process at the beginning of the year includes use of the FMFPac Resource Allocation Model (RAM). During Mid-Year Budget Review and disposition of year end funding, the RO Fill Rate determines, in part, which SASSY Management Unit is to receive additional funding.[11]

B. RESEARCH METHODOLOGY

1. Definition of the Problem

After conducting interviews and reading the in-house literature, it became clear that the lack of ability to predict SASSY variable values was indeed a major problem.[12] From the correspondence viewed, it was determined that there was a real problem with SASSY Management Unit overhead expenses not being budgeted for adequately by anyone, with the result that the RA = PE equation was being disturbed.

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[11] Conversation with Col. Johnson, Comptroller, FMFPac, 1 April 1981.

[12] See Appendix A.

Corrective action was being taken to maintain the equation as an inequality by purposefully making RA greater than or less than PE, depending upon timing.[13] Additionally, it seemed that increased year-end spending of RA funds resulted in a short fall PE position for the SASSY Management Unit. Had there been a known relationship between fill rates, backorders established/released, inventory investment levels, and other variables, it might have been possible to determine the amount of business that the various funding levels could support. This line of reasoning led directly to the formulation of the problem statement:

> To determine the relationships, from field data, that describe actual SASSY Management Unit operations and develop predictive models for the major variables based upon those relationships.

The problem statement was then reduced to several research questions which guided the thesis effort.

a. What is the relationship between Requisition Objective Fill Rate and Complete Fill Rate?

b. What is the relationship of Requisition Objective Fill Rates and Complete Fill Rates to other quantifiable SASSY variables?

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[13] See Appendix A.

c. What is the relationship between Total Demands and Requisition Objective Demands to Complete Fill Rate?

2. Development of the Hypothesis

The research questions initially developed were by design supportive of the thesis hypothesis that quantifiable constant relationships exist between SASSY variables. It was yet unknown whether any meaningful relationships might exist that were of a sufficiently high confidence level to be useful for predictive purposes. It was yet unknown whether there would be small enough standard errors of the estimate (SEE) to make the predictions worth-while. There was a trade-off which had to be made between being very confident about very little and marginally confident about a great deal. The hypothesis was developed with Type I and Type II errors in mind.[14] To falsely reject the hypothesis that there are stable relationships between SASSY variables would be to continue SASSY Management Unit operations in the same manner as now.[15] A distinction is made between "failing

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[14] Type I errors in hypothesis testing are those that result from rejecting a true hypothesis, whereas Type II errors result from failing to reject a false hypothesis.

[15] The documents contained in Appendix A indicate that the status quo is not completely satisfactory and has some cost in terms of less than possible supply support for the same price and same effort.

to reject" and "accepting" a hypothesis. Failing to reject the hypothesis if false could result in management decisions being made on the wrong basis. There is no way to determine the costs of the Type I and Type II errors, but it is intuitively appealing, however, to believe that the system is working reasonably well and that introduction of new management policy (Type II) might seriously and expensively disrupt the system before the problem was identified and corrected.

3. Search for Data

The source of SASSY data was obvious--the SASSY Management Unit at Camp Pendleton. The question became very quickly "what data?" and "how far back in time?". The "what data?" question was answered by past events in that only certain historical data were available as many of the non-summarized data had been replaced in the files by current data. For preliminary work, data was accumulated in the following categories for years FY 1977-1979:

- Percent Complete Fill Rate
- Percent Requisition Objective Fill Rate
- Number of National Stock Numbers (NSN's) On Hand
- Dollar Value of National Stock Numbers (NSN's) On Hand
- Number of Requisition Objective (RO) NSN's On Hand

- Dollar Value of RO NSN's On Hand
- Percent Availability of RO NSN's On Hand
- Dollar Value of NSN's with Dues
- Total Demands
- Percent Demands for RO Items

These categories of data were selected after discussions with the OIC, SASSY Management Unit, wherein it was determined which data were, in fact, available for collection and could be verified by normal audit procedures.

4. Research Task

The research task, developed from the problem statement, was a significant beginning step in the actual research phase of this thesis. Specifically, the broad general terms of the problem statement left the thesis writer with nowhere in particular to start. The narrowness of the research task statement and the research sub-tasks statements provided a good "jumping-off" point and allowed the use of computer-based analytical techniques. The research task statement: Determine the relationships of the categories of data collected at the SASSY Management Unit to the variables of primary concern. The research sub-task statements further defined the effort in terms of types of primary variables. Note the two separate classifications:

a. Determine the relationships of measurements of overall SASSY Management Unit performance, Complete Fill Rate and Requisition Objective Fill Rate, to the other categories of variables collected.

b. Determine the relationships of the measurements of SASSY Management Unit volume of business, Total Demands and Requisition Objective Demands, to the other categories of variables collected.

5. Research Design

The research design followed directly from the research tasks and sub-tasks. A review of the modeling literature, operations research literature and inventory management literature suggested that multiple linear regressions and correlation analysis had great potential for ferreting out the unknown relationships between SASSY variables. The correlations would indicate whether the variables being obtained at the SASSY Management Unit had much potential for inclusion in regression equations. The multiple linear regression approach had the advantage of "letting the data speak for themselves." If a relationship could not be shown by the regression equation's F or t-tests at any acceptable confidence level, then the hypothesis would just not be supportable by the data, a fact which

would be of very definite interest to the OIC, SASSY Management Unit.

The research design is such that it prevents unnecessary data collection, which is not only time-consuming and unrewarding, but expensive. It was intended to get only one year's monthly data with which to show relationships and to use a second year's monthly data to validate the regression equations developed. The first run of correlations and regressions produced equations for Complete Fill Rate and Requisition Objective Fill Rate with low Coefficients of Determination (COD) and high standard errors of the estimate (SEE). A number of data transformations were attempted with minimal increase in the coefficients of determination. Tried were "Power Curve", "Logarithmic Curve", "Exponential Curve" and "Variance Stabilizing" transformations.[16]

It appeared that little would come of this approach with the data and the variables available. The options remaining:

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[16] The data transformations used were of the more common variety:

1. Power Curve $Y = bx^{m}$
2. Logarithmic Curve $Y = b + m\ln x$
3. Exponential Curve $Y = be^{mx}$
4. Variance Stabilizing $Y' = Y/X$, $X' = 1/X$

•To use several year's worth of monthly data with the same variables as orignially selected. •To seek other variables of higher predictive and correlative power. •To attempt another analytical technique.

The first option seemed the most expedient as the several year's worth of data for the variables selected were obtainable from the SASSY Management Unit. In the data collection effort, the data were checked for accuracy. There was no doubt that the data were compiled from the actual operations of the SASSY Management Unit. Daily operations had been correctly talleyed into weekly and monthly summaries, and those values which appeared suspect were checked individually to determine if they were typographical errors or some other form of misrepresentation. Not once was the monthly summary data provided by the SASSY Management Unit found to be in error. Thus was it possible to dismiss the often troublesome question of instrumentation bias. The data collected are correct and accurately represent SASSY Management Unit operations during the period covered. The second option seemed viable, especially if it could be combined with the first. There were significant variables missing from the equations but there was no indication of what was missing.

After several meetings with the OIC of the SASSY Management Unit, it was decided to use the following variable list, but with the understanding that only FY 1979 and FY 1980 data would be available for all the variables of interest.

C. DEFINITIONS OF THE VARIABLES

The following is the final primary variable list with a short explanation of the meaning of each variable and what it measures:

V1: Percent Complete Fill Rate--The percentage of all customer requisitions which were filled from shelf stock during the period covered.

V2: Percent Requisition Objective (RO) Fill Rate--The percentage of all requests for RO items which were filled from shelf stock during the period. RO items are those authorized for stockage and expected to be in stock as determined by usage over the past twelve months. Criteria for stockage are variable based upon unit price and usage.[17] The RO List is updated monthly by computer process to determine NSN's which should either be added to or dropped from the list. The difference between Complete Fill Rate

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[17] See Appendix A for stratified buy algorithm contained in 1st FSSG point paper of 4 April 1979.

and the RO Fill Rate is that the Complete Fill Rate covers both those items which have been named to the RO List and those without requisition objectives. The usage of an item, in addition to determining where that NSN is on the RO List, also determines the number of items, or quantity, within an NSN (line item) which are authorized for stockage on hand. Note that the actual quantity of inventory on hand in a given NSN may be less than, equal to, or greater than the RO authorized stock level, depending upon and funding and stockage decisions. Generally, RO is the inventory goal or objective as determined by usage and the customers' indications of recurring need. In other words, it is that amount of stock in a given NSN which would be on hand if the stockage level exactly met the requirements as determined by usage.

V3: Number of National Stock Numbers (NSN's) On Hand--This is the number of different NSN's on hand and is often called number of line items. This is indicative of the range of stock, not the depth of stock, and is measured at the end of the month.

V4: Dollar Value of NSN's On Hand--This is the dollar value of the inventory position and is measured at the end of the month. The dollar value is measured in millions of dollars.

V5: Number of NSN's with an RO--This is the number of line items which have been placed on the RO List as a result of past usage and the customers' indications that these items are of recurring demand.

V6: Dollar Value of NSN's with an RO--This is the dollar cost in millions of dollars to stock RO items to their stockage objectives.

V7: Number of RO NSN's On Hand--The number of RO NSN's that have an on hand balance as of the end of the month. This means that there is at least one each of an item on hand in a given RO NSN for it to be counted, and not necessarily the entire RO quantity.

V8: Dollar Value of RO NSN's On Hand--This is the dollar value in millions of dollars of the RO line item inventory taken at the end of the month.

V9: Percent Availability of RO NSN's On Hand--This is the percentage of all the stocked RO items which can be issued upon customer request. It is common and an on-going process

to pull "mount-out blocks" of supplies to be set aside for deploying units. With the number of deployments from Camp Pendleton, about twenty percent of the RO NSN's are not available for issue to customers at any given time.

V10: Receipts from Due--The number of items that were previously ordered by the SMU to replenish inventory or to directly satisfy customer demand, and which were received from the source of supply during the month.

V11: Number of NSN's with Dues--This is the number of line items which have been ordered but which have not yet been received by the SASSY Management Unit's General Account.

V12: Dollar Value of NSN's with Dues--The value in thousands of dollars of outstanding orders to sources of supply placed by the SASSY Management Unit, i.e., the cost of stock on order as viewed at the end of the month.

V13: Number of NSN's with Excess Dues Over Requisition Plus Economic Retention Quantity--Excess dues are the number of line items (previously ordered by the SASSY Management Unit) that contain stock greater than the Requisition Objectives for those line items and stock for non-RO items (by definition, excess). Economic Retention Quantity (ERQ) is an authorized over RO stockage level for RO items with an

on hand quantity greater than the requisition objective but equal to or less than a three year supply based upon usage. It is the amount of stock over the authorized level up to a three year supply level.

V14: Dollar Value of NSN's with Excess Dues Over RO + ERQ--This is value in thousands of dollars of the stock on order in excess of the ERQ amount.

V15: Total Demands--This is the total number of requisitions placed with the SASSY Management Unit, and is a measure of the volume of business being done. It has two components, RO Demands and Non-RO Demands.

V16: Number of Demands for RO Items--This is the volume of business done in RO requisitions. Line items ordered by customers during the month are counted if they are on the RO List.

V17: Percent Demands for RO Items--This is the ratio in percent of V15 and V16. "In theory, it is desirable to have as close to 100% of the demands against RO as can be attained."[18]

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[18] 1st Force Service Support Group, Working Paper--General Account Inventory.

V18: <u>Number of Backorders</u>--The number of line items that are to be filled from dues. Each requisition against a not in stock item results in the creation of a backorder.

V19: <u>Number of NSN's with an RO Requirement But Not On Order</u>--That which needs to be ordered to keep stockage levels up to RO, but which have not been ordered for one reason or another. The usual reason is a lack of PE funds to obligate. Contrast this with backorders; backorders result from customer demands which could not be filled from shelf stock, whereas V19 is a SASSY Management Unit generated need.

V20: <u>Dollar Value of NSN's with an RO Requirement but--Not on Order</u>--This is the amount in thousands of dollars to bring the stockage levels up to their proper RO status. It does not include dues.

V21: <u>Number of NSN's On Hand Over RO + ERQ</u>--These are the true excesses of the system. These are the line items that are stocked past their RO and three year's supply (ERQ).

V22: <u>Dollar Value of NSN's On Hand Over RO + ERQ</u>--This is the cost of the true excesses described in V21, and is reported in millions of dollars.

V23: Number of NSN's with 30 Day Usage--The number of NSN's for which the 12 month's usage is greater than zero.[19]

V24: Dollar Value of NSN's with 30 Day Usage--This is the extended value in millions of dollars of 30 day usage multiplied by the price for each counted NSN.

V25: Warehouse Issue Confirms--The amount of business that the General Account warehouses do in the month. It represents the number of requisitions issued through the warehouses.

V26: Percent Total NSN's On Hand Which Have an RO--This is the percentage of stock carried at the end of the month which has a requisition objective.

V27: Percent of the Total Value of NSN's On Hand Which Have an RO--This represents the percentage of the total inventory which is dedicated to RO line items.

V28: Regular and Hot Item Backorders Released--V28 and V29 will be treated jointly because they are closely related and separate definitions would be redundant. When regular backorder (BO) is established against low priority customer

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[19] Decimals are not carried in this SASSY computation; therefore, less than .5 is treated as zero. SASSY defines 30 day usage as 12 months usage/12, thus only those NSN's which have had 6 or more "hits" are counted.

demands (Issue Priority Group 3) for normally stock items (RO) temporarilly out of stock (NIS). This established an General Account obligation to the customer against incoming stock. Regular backorders are included in stock requirements when stock buys are computed.[20] A high priority customer demand (IPG I and IPG II) for normally stocked (RO) items temporarily out of stock (NIS) is "passed" to the source of supply (DoD Integrated Material Manager, IMM) as an A3A transaction with SASSY Management Unit OPBUD/PE funding.[21] Note that this is a case of the SMU's General Account directly funding a specific customer requirement as opposed to a general stock buy with AOA dollars. This obligation of SMU OPBUD/PE monies is driven by customer requirements and is not within the management discretion of the Officer-in-Charge of the SMU. If the "passed" RO item was IPG I or IPG II NORS, then a hot item backorder is established by the General Account.[22] Hot item backorders are released to customers to take advantage of order ship lead time on previously established stock dues. The hot

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[20] Buy requirement = RO + BO - On Hand - Dues. Note that this equation is in the form Buy Requirement = Requisition Objectives - Assets.

[21] See V30 and V31 definitions for discussion of A3A and AOA.

[22] NORS: Not Operationally Ready, Supply. A maintenance category for inoperative combat essential equipment as opposed to NORM: Not Operationally Ready, Maintenance.

item backorder will be released to the customer if the stock due is received by the General Account prior to issue of the "passed" document by the Integrated Material Manager (IMM). This establishes a General Account memorandum obligation to the customer against incoming stock, but is not included in the requirements when stock buys are computed. Release occurs when the stock becomes available and is issued to the customer and the specific backorder document number.

V29: Regular and Hot Item Backorders Established--See the discussion of V28 above.

V30: AOA Dollar Value--This is the SASSY Management Unit funding of stock. It represents the monthly investment in new inventory to achieve RO positions. As an aside, the AOA name comes from the Document Identifier Code (DIC) used to transmit these funds. The AOA amount is presented in thousands of dollars.

V31: A3A Dollar Value--The A3A Dollar Value, like the AOA Dollar Value, is the monthly total dollar value of customer documents passed to the IMM for action with OPBUD/PE funding. Whereas AOA monies are used for achieving desired stockage levels, A3A moneies are used for direct funding by the SASSY Management Unit of the customer requirements as in

backorders, etc. As with AOA, A3A is measured in thousands of dollars and is cumulative throughout the month.

V32: Month of the Fiscal Year--This is a "counting" variable to account for the differences in funding for the different quarters in the fiscal year. Often it is feast in the first two quarters and famine in the third and fourth. Sometimes, there are year-end monies available which can be provided to the SASSY Management Unit to improve its inventory position. V32 was included just to keep track of whether the phase obligation rate planned in the annual budgets and the mid-year review of those budgets had any effect on SASSY Management Unit operations. Note that 1 corresponds to October and 12 corresponds to September.

V33: Number of the Period--This is another counting variable which was included to show changes over time, and against which the other variables could be plotted. For example, one of the changes over time is the number of NSN's on hand. Each year, the number of line items carried in stock has shown an increase. Other variables have increased or decreased, and V33 would be used to help predict those changes over time. Note that the number of the periods start

with 13 and go to 36 (13 corresponds to Oct 78 and 36 corresponds to Sep 80).

D. SUMMARY

These first exploratory studies provided insight to the operations of SASSY and the environment faced by the SASSY Management Unit at Camp Pendleton. As mentioned in the Methodology paragraph, Chapter I, there was little expectation that the first run of variables would produce the perfect regression equation. These first runs using the variables just listed provided background understanding to search for other and better predictor variables and provided a sound basis to go into the statistical analysis phase of the research.

III. DESIGNING THE MODELS

A. INTRODUCTION

1. Review of the Literature

After a reveiw of statistical modelling literature, it became evident that because of the exceptional variability of the data, regression analysis and time series analysis techniques held the key to determining the systems relationships in SASSY as viewed from the perspective of the OIC of the Camp Pendelton SASSY Management Unit. The characteristics desired for the spending model during the model development phase often seemed contradictory. The difficulties in modelling "open" and "relatively closed" systems are legion. In some respects, the SASSY Management Unit functions as a relatively closed system "with all the attendant properties such as entropy."[23]

2. System Relationship Considerations

Viewed from a systems-thinking perspective, the SASSY Management Unit looks fairly simple until the impacts of external pressures and events beyond the control of the

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[23] Klir, J. and Valach, M., Cybernetic Modelling, Iliffe Books, 1967. Entropy is the loss of energy and resources because of their consumption within a system without replacement.

OIC are analyzed. In a relatively closed system, the path over which the external environment act upon the system are accurately defined. Such is partially the case of the SASSY Management Unit: inputs flow along predetermined lines and the inputs themselves, supplies, equipments, and O & M, MC appropriated funds are very accurately defined and quantified. Other inputs such as managerial decisions by persons other than the OIC and which are made external to the system, are not so easily quantified, but they can be described. There is no limiting the range of conditions and events that effect the inputs to the SASSY Management Unit, for they range from Congressional Committee opinions to foreign affairs, to technological change, and even to the state of the economy and the mind of the nation. It is expected that the operation of a supply system which is externally funded (inputs) with more than $20 million each year reflects Presidential and Congressional and other political decisions. For these sorts of reasons, the funding levels at the SASSY Management Unit tend to vary considerably. Note especially the graph of V30 ($AOA) and V31 ($A3A) against time in the graphs in Appendix B. There appears to be little constancy in funding decisions. The hypothesis, that there are constant systems relationships

among SASSY variables, depends upon a certain amount of dynamic equilibrium or homeostasis. Walter Buckley, though writing principally of complex adaptive social science systems, described the relatively closed system thusly:

> "Equilibrial systems are relatively closed and entropic. In going to equilibrium, they typically lose structure and have a minimum of free energy; they are affected only by external 'disturbances' and have no internal or endogenous sources of change.....and since they are relatively closed, they have no feedback or other systematic self-regulating or adaptive capabilities."[24]

It is easy to see that the General Account would soon empty if the customer demands continued unabated after financial inputs are discontinued or blocked. The matching of inputs to outputs provides the management with a complex but structured task. In setting funding levels to achieve a 75% (Headquarters, Marine Corps directed) RO Fill Rate Goal, an external equilibrium is forced upon the system. But as in most complex, not completely closed systems, many of the external demands upon the system are conflicting. The set relationship that RA funding provided to customers generally closely equals the amount of OPBUD/PE funding provided to the SASSY Management Unit and the setting of a funding goal to accomplish a 75% RO Fill Rate, takes away from the

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[24] Buckley, W., "Society as a Complex Adaptive System", Modern Systems Research for the Behavioral Scientist, Aldine Publishing Co., 1968, p.490.

internal structure of the SASSY Management Unit and allows it in effect to be controlled from the Headquarters, FMFPac and Headquarters, Marine Corps, levels. Remaining, nonetheless, in the SASSY Management Unit is "an interlocking complex of processes characterized by many reciprocal cause-effect pathways."[25]

3. System Definition

In attempting to view the SASSY Management Unit as an entity, it must be remembered that as with any other system, it is a collection of interconnecting systems. In essence, this is the first lesson of systems, that any definition of systems is recursive, i. e., an understanding of the object system as a whole depends upon an understanding of its parts, which in turn are themselves systems comprised of other systems. The point is to define the SASSY Management Unit, i. e., to establish finite limits and boundaries in order that the definition can be further reduced to a set of linear equations showing the principal relationships. The setting of limits proved to be troublesome--there was little indication of where to draw the line and to end the system. "There are always other

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[25] Watt, K. E. F., Systems Analysis in Ecology, Academic Press, 1966), pp. 1-3.

external as well as internal relationships that can be added to portray a more complete picture of what is going on."[26] The definition of the SASSY Management Unit was tied to the hypothesis and the obejectives of this thesis. It makes little sense if the definition leads to development of an unusable model. The need for an appropriate decision support system, or usable model, is being emphasized. A greatly simplified set of relationships of the SASSY Management Unit to its environment are depicted in Figure 1.

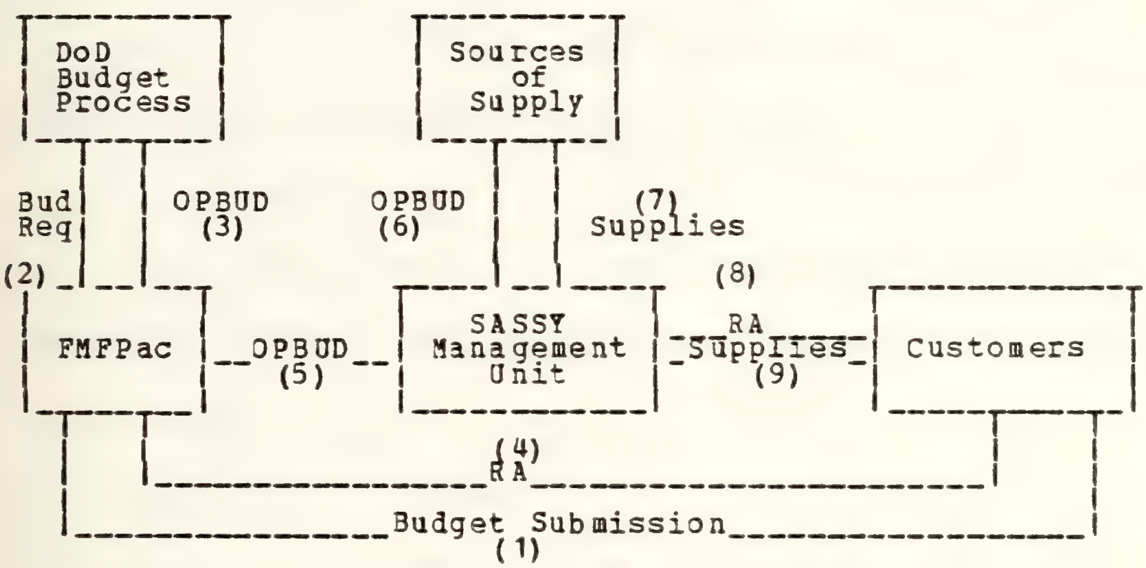

FIGURE 1: Budget and Supply Relationships

Reading the Figure 1. diagram in sequence of numbers shows that the process is iterative:

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[26] Beckett, J. A., Management Dynamics: The New Synthesis, McGraw Hill, 1971, p.33.

1. The customers of the SASSY Management Unit prepare their budgets for submission to Headquarters, FMFPac.

2. FMFPac sends the aggregate forward where eventually it enters the Department of Defense Planning, Programming, Budgeting System (PPBS). For the purpose of this thesis, it is sufficient to say that at some point in time, the Office of Management and the Budget (OMB) apportions some of the appropriated funds to Headquarters, Marine Corps.

3. From Headquarters, Marine Corps, some appropriated funds are reallocated to Headquarters, FMFPac. Here the OPBUD/PE funds are matched with RA funds.

4. The customers receive RA funds.

5. The SASSY Management Unit receives equivalent OPBUD/PE funds, thus maintaining the general RA=PE relationship.

6. The SASSY Management Unit orders supplies and equipments from its sources with $AOA for stock replenishment and with $A3A for direct funding of customer requisitions.

7. The materials "received from dues" arrive from the suppliers and are available for issue to customers.

8. The customer requisitions materials using RA funds.

9. The SASSY Management Unit issues the materials.

Figure 1 looks deceptively simple. The quantification problem comes in when one realizes that the SASSY Management Unit may not have adequate funds remaining from its stockage actions to direct fund a customer requirement. When this occurs, a "backorder" is established. Only when OPBUD/PE funds become available is the backorder "released". The lag time between ordering supplies (creating dues) and their receipt averages between sixty and ninety days for the Camp Pendleton SASSY Management Unit. A subtlety not immediately evident is the mix of budget years. The customers' budgets are submitted for the POM process which preceeds the authorization process and the year later follow on appropriations process. The funds received by the SASSY Management Unit are the result of customer budget actions two years earlier. A change in commitments can result in running out of funding.[27] Customer requistions continued nonetheless. Various reprogramming actions at the FMFPac, Headquarters, Marine Corps, Department of Defense and Office of Management and the Budget levels can result in

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[27] Note in Appendix B that during February 1981 only $27,000 was available for restockage purposes ($AOA) instead of the usual more than $850,000.

unanticipated funding shortfalls. In other systems, to avoid being subject to the vagaries of the political system and the federal budget process, a "stock fund" is created. Congress appropriates funds which are then used by the Marine Corps to create a "corpus" which is used to provision the stockfunded supply system which is thenceforth run as a business where customers are charged a surcharge plus the cost of the merchandise to cover overhead, losses and restocking. In this manner, the stockfund continues to function without requiring additional funding from Congress except in extraordinary cases when the stock fund levels have been drawn down because of unforeseen price increases, etc. This is not, however, the case with the SASSY Management Unit and its General Account; it has no corpus.[28]

B. PRELIMINARY REVIEW OF THE DATA

1. The Data

a. Variability

Table 1 is a summary of the data for Fiscal Years 1979 and 1980 upon which the model is built. Notice

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[28] Stockfunding of operating forces is currently being tried in the U. S. Navy for aircraft carriers, but otherwise is restricted to the specified shore establishments.

particularly the coefficients of variation; that the data are extremely volatile is best shown by the coefficient of variation of .8378 for V30--AOA Dollar Value.[29] For the OIC of the SASSY Management Unit to be able to make sense of data which vary so tremendously, he must have a very clear knowledge of what happens to the other variables when V30 moves from extreme to extreme. Further confusing the issue are variables such as V23--Number of NSN's with 30 day usage, which vary little at all (Coefficient of variation .03441). Each of the primary variables, V1 through V31, are graphed against time in Appendix B. Without further analysis, it would appear to the OIC that many of the data are random while others seem to establish somewhat of a steady state. It is strongly recommended that the reader peruse the graphs as they dramatically illustrate why this thesis is in a virgin area--the variables do seem to move without pattern for the most part.

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[29] Coefficient of variation = mean/standard deviation

Table 1

FY 1979 and 1980 Data, Summary Statistics

ar	Mean	Std. Dev.	Coeff. of Variation	Skewness	Kurtosis
	58.1428	4.7028	.0809	.0877	-1.0815
	72.4904	4.1157	.0568	.2890	-1.0679
	30129.4102	2667.7378	.0889	-.0608	-1.0904
	6.4667	1.4441	.2233	.1801	-1.5713
	27673.3164	2677.7378	.0701	.0231	-1.1107
	5.8524	1.0122	.1730	.4332	-1.3002
	22219.0352	1696.8357	.0764	-.9927	.2779
	4.8095	1.1593	.2410	.4140	-1.3536
	80.2856	6.6187	.0824	-.5403	-1.1138
0	5410.8828	2357.0376	.4356	.0622	-.1729
1	6675.4141	2239.3613	.3355	-.3911	-1.1595
2	3128.5706	808.7935	.2585	.1605	-.8635
3	572.4749	168.2852	.2940	.5764	-.8314
4	128.9523	67.4058	.5227	2.9575	9.1613
5	28114.4570	4394.2813	.1563	.3295	.3295
6	20696.3633	4269.1953	.2063	.8924	.8924
7	73.9047	5.8387	.0790	.3203	-.6343
8	7383.1250	1224.4412	.1658	-.2909	-.5477
9	7830.8095	3458.3787	.4416	1.5300	-1.2900
0	1224.2857	541.7980	.4425	.0900	-1.2200
1	12599.3125	3284.8394	.2607	.1450	-1.1383
2	2.2333	.9876	.4422	.3191	-1.4577
3	13971.8359	480.9121	.0344	-.5438	-.4120
4	1.6429	.6516	.3966	3.5726	12.2819
5	21690.8438	4629.9492	.2135	1.2579	1.1473
6	73.0947	8.1173	.1098	-.3929	-.5396
7	74.3809	4.3183	.0581	-.2658	-1.0604
8	4091.6475	1246.2593	.3046	.5352	-.9901
9	6165.3125	1701.2065	.2759	.9053	-.3978
0	922.7607	773.1135	.8378	1.0472	-.1819
1	785.9509	400.9336	.5101	1.0925	.1898

b. Skewness

Not only was it enough that the data were ound to be highly volatile with extreme coefficients of ariation, but they were also characterized by a tremendous ange of skewness. Skewness is a statistical property escribing a lack of symmetry about a measure of central endency and is measured by comparing the arithmetic mean of sample or population distribution with its median. If the istribution were symmetrical, the mean and the median would

be the same and the skewness would be zero. Appendix B and Table 1 show that some of the data are exceptionally skewed. Examples are V14-- $ Value of NSN's with Excess Dues Over Requirement and Economic Reorder Quantity, V19, V24--$ Value of NSN's with 30 Day Usage. Yet other data are more easily described by the Normal Distribution: V1--Complete Fill Rate, V3--Number of NSN's on Hand, V5--Number of NSN's with an RO, and V10--Receipts from Due. It is a tribute to the self-compensating properties of the system that variables such as V1 and V10 have symmetrical distributions. One would normally expect that as the system is stressed with extreme variability in funding levels that the $A3A and $AOA purchases establishing dues would cause V10 to be skewed and extremely volatile, but as can be seen in Table 2 V10 is relatively stable.

Table 2
V10 Distribution Characteristics

Mean	Std. Dev.	Coeff. of Variation	Skewness	Kurtosis
5410	2357	.4356	.0622	-0.729

After examining the distribution characteristics of variables such as V10, the choice of multiple linear regression seemed more appropriate as model-building analytical techniques. The cyclical up and down movement of the variables as shown in Appendix B graphs suggest time

series analysis combined with the multiple linear regression.

c. Kurtosis

As was the case with the coefficient of variation and the skewness, the data distributions further exhibited some fairly extreme values of kurtosis.[30] Most of the distributions, as seen in Table 1, are "flatter" than the Normal Distribution. There was a tendency for variables which were the most skewed to also be the most kurtotic. The better examples of this pairing of characteristics are V14, V19, V20 and V24.

2. Summary

The extreme variability of the data gives the Appendix B Graphs a "shot-gun" appearance. This apparent randomness is reduced in part by the high values of skewness and kurtosis which lead one to believe that the thesis hypothesis might hold after all. The skewness and kurtosis were indicative of trends and relationships that were operative among the variables. For this reason, the decision to proceed with multiple linear regression was confirmed. The preliminary regression work reported as

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[30] Kurtosis is a measure of the concentration of values about the mean of a probability distribution. The Normal Distribution has a kurtosis value of 3.0.

unsatisfactory in Chapter II, was the result of not having the correct variables to introduce to the regression equation. There was nothing inadequate in the technique. As will be shown later on in this Chapter, the use of "Variance Stabilizing" transformations because of the extreme variability of some of the data was not required when the proper variables were identified for inclusion in the regression equations. The use of "Logarithmic Curve" transformations to reduce skewness also was not required when the proper variables were selected. The same held true for the "Exponential Curve" transformations to reduce kurtosis.

C. DEVELOPMENT OF THE MODEL

1. Introduction

In determining the type of model to be developed, it was useful to consider some of the characteristics of models:

> "What is a model? A model is a simplified representation of reality. Why use models? Models are used in analyzing events, activities and systems because they provide an attention-focussing and economizing mechanism for analysis and problem solving. A model is selective. It includes only those factors that are considered most relevant, from all possible factors that could be relevant for analysis and problem-solving regarding an issue. In addition to the factors, a model incorporates those relationships between factors which

parently (or presumably) influence or cause the output result which is the subject of the analysis."[31]

view of modelling is similar to the Keen and Morton oach to decision support systems (DSS). Both tend to asize the need for effective decision-making. "There is n a conflict between efficiency and effectiveness. ctiveness requires adaptation and learning, at the risk redundancy and false starts....Efficiency involves a owing of focus and minimization of time, cost and/or rt required to carry out a given activity."[32] The most tical aspect of the DSS approach is that it emphasizes model to be built aorund a given decision-making task, even while the technical issues may be exceedingly lex, as is the case with the SASSY Management Unit, the cipal thrust of DSS models is managerial. The model is expected to determine how the OIC should spend his A3A AOA funds, but to assist in that decision by identifying quantifying the system parameters and relationships so a more informed, more competent decision might be made.

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llen, J. B., Zand, D. E., and Lewin, A. Y., "The Use of ls for Analyzing the Budget Decision Making Process,", d Forces Comptroller, Vol. 18(2-4), U. S. Govt. ication, 1973, p.17.

een, P. G. W. and Morton, M. S. S., Decision Support ems: An Organizational Perspective, Addison-ey, 1978, p.7.

A major caution while developing the model was to make it transferable to the user at the SASSY Management Unit. The "technology transfer" question addressed in Chapter VI is not an idle one. As Keen and Morton write about esoteric models of great complexity:

> "The most prominent work in management science has obviously been the development of optimization models, especially linear programming and related techniques. While many of the algorithms are still fairly esoteric (there are probably more articles on integer programming than there are real world uses of it), this effort has had a substantial inpact on many large organizations."[33]

By way of contrast, models need not be so complicated in use that the using organization requires special staffing with persons of extraordinary talent. In no way does a simple to use model mean the model is of limited use, even though it fails to operate as an optimizing model. It has to be noted very clearly that an optimizing model can produce a solution which is not politically, economically, socially or operationally feasible, i. e., if unlimited assets and all the information were there in the first place, a model would not be required. "Many DSS are model based and typical of the management science tradition, but also tend to be fairly simple and sacrifice technical elegance in order to make them more conceptually accessible to the user. Several of

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[33] Ibid., p.45.

the most effective DSS were are familiar with would be disdained by most management scientists."[34] There is an optimal mix and volume of information input for any manager. "Complexity Theory" argues that too little or too much input load leads to boredom resulting in the model or DSS getting little use. It is apparent that too much information may be as dysfunctional as too little. This follows from the "U-Curve Hypothesis: Information processing by 'people in general' reaches a maximum level of structural complexity at some optimal level of environmental complexity (point X in Figure 2.). Increasing or decreasing environmental complexity (points Z and Y) from the optimal point (X) lowers the conceptual level."[35]

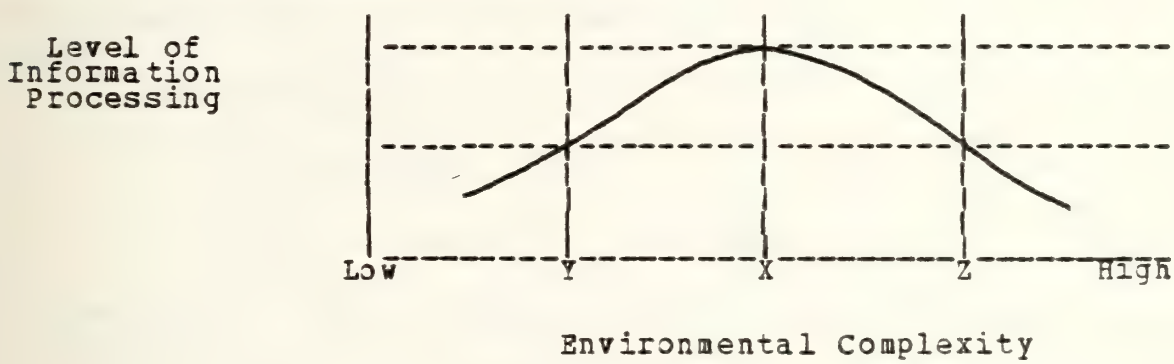

Figure 2: Complexity Theory

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[34] Ibid., p.59.

[35] Shroder, H. M, Driver, M. J. and Steufert, S., <u>Human Information Processing</u>, Holt, 1967, P.37.

2. Simulation Versus Optimization

As seen previously in this Chapter, models designed to support managers' decisions may be conceptually different from the more rigorous optimization algorithms used in the areas of structured decision-making. Model usefulness does not correspond to sophistication. "Small, informal models that get better answers than now exist are required, not elegant sophisticated examples of the researcher's art. Simulation models, which represent a manager's concept of the key interactions of environmental variables, may be much more useful than optimization algorithms that are conceptual abstractions of the problem."[36] Note that the statistical descriptions of the SASSY Management Unit data in Table 1 lend themselves to use in a simulation model.

3. Regression Analysis

a. Introduction

"Simply stated, regression analysis is the utilization of relationships between variables (taken from historical data) to predict values of a specific variable when given the values of the others."[37] The technique of regression analysis enables the system manager to substitute

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[36] Ibid., p.93.

[37] Deakin, E. B. and Granof, M. H., Directing Audit Effort Using Regression Analysis," CPA Journal, (Feb., 1966), p.29.

statistical judgement, based upon the variable relationships over time, for intuition. Because of the statistical properties of regression equations, he has a feeling for the confidence he should place in the predictions made as a result of inputing data to the regression equation. Many regression problems involve more than one independent variable. An equations encompassing more than one independent variable is called a multiple linear regression model. The model takes the general form

$$Y = B_0 + B_1X_1 + B_2X_2 +.........+ B_kY_k + \text{Error term}$$

The parameters B_1, B_2.......B_k are called regression coefficients. B_0 is a constant. In more technical terms, "This model describes a hyperplane in the k-dimensional spaces of the independent variables."[38] The parameters are called partial regression coefficients because they describe the partial effect of a given independent variable on the dependent variable, Y, when the other independent variables are held constant. The method of least squares is used to estimate the regression coefficients.

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[38] Hines, W. W. and Montgomery, D. C., <u>Probability and Statistics in Engineering and Management Science</u>, Second Ed., John Wiley & Sons, 1980, p.393.

b. Proprietary Statistical Software

Many proprietary statistical software packages are available with regression routines. The two used for the statistical work in this thesis were Statistical Package for the Social Sciences (SPSS).[39] and the UCLA Health Sciences Center Biomed (BMDP).[40] A preference was developed for the BMDP 2R Stepwise Regression program to identify variables for further work using the BMDP 9R All Possible Subsets Regression. BMDP 2R computes the estimates of the parameters of a multiple linear regression equation in a "stepwise" manner, i. e., the variables are introduced to the equation (forward stepping) or extracted from the equation (backward stepping) one at a time according to their individual confidence intervals. Generally, a 95 percent confidence interval was used when introducing new variables. In developing the regression equations, notice was taken of the fact that the regression model was to be used to predict future observations of various independent variables.

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[39] Nie, N. H., Hull, C. H., Jenkins, J. G., Steinberger, K., and Bent, D. H., "SPSS: Statistical Package for the Social Sciences", 2nd. Ed., McGraw-Hill, 1975).

[40] Dixon, W. J. and Brown, M. B., "BMDP-77: Biomedical Computer Programs P-Series", Univ. of CA Press, 1977.

c. Extrapolation

A model that fits well in the region of the original data will in all likelyhood fit poorly outside that original region. When the models developed in this thesis are forwarded for use at the SASSY Management Unit, care must be taken not to inadvertantly extrapolate beyond the region containing the original data. The levels of the variables jointly define the region containing the original data. Figure 3 provides a graphic display of how easy it is to extrapolate beyond the region defined jointly by the orginial data. One could easily think that the point (X_{01}, X_{02}) lies outside of the joint region of the region of the original observations even though x_{01} lies within the range of X as X_{02} lies within the range of X'. Thus, attempting to predict the value of a new observation at (X_{01}, X_{02}) would be an extrapolation of the original model and would tend to result in an unsatisfactory prediction.

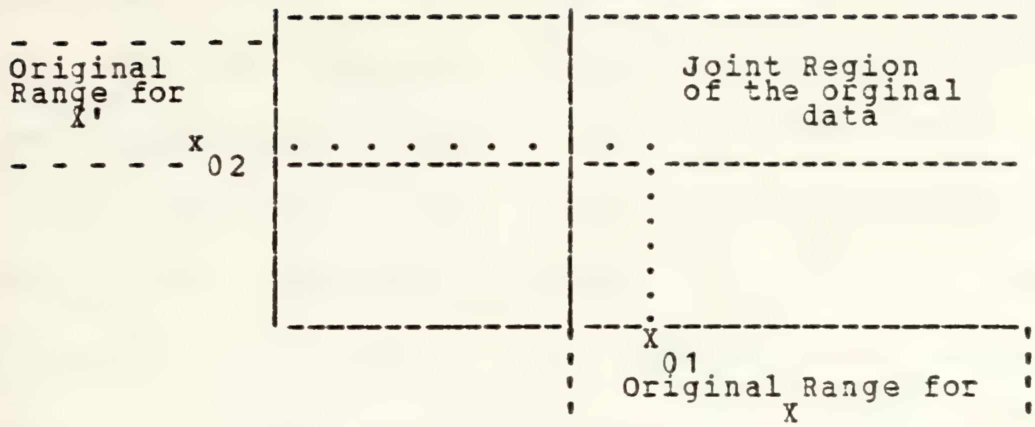

Figure 3: Extrapolation from Joint Region of Original Data

d. Model Accuracy

The technique used to determine the adequacy of the multiple linear regression models was that of the coefficient of determination (COD). COD is a measure of the amount of variance in the dependent variable explained by the variance in the independent regressor variables. Adding variables will increase COD but does not necessarily add to the predictive power of the regression equation. In building the models, variables were not entered into the equation using BMDP 2R unless they successfully passed an F-test hurdle at the 95 percent confidence interval.

e. Residual Analysis

Normal probability plots of the "residuals" were produced for each regression equation to provide an idea of whether the error terms were going to be a problem.

In those cases with several outlying values in a given variable, an effort was made to find other variables which could be used instead and not detract from the predictive power of the equations. These normal probability plots of the residuals are presented in Appendix D. Note that for the most part, the effort to find equations with normally distributed error terms was quite successful. Ideally, the x-axis spread in the graphs would be a small number and that it would be symmetrical about a point 0 standard deviations, and the graphed values would appear as a straight line.

IV. STATISTICAL ANALYSIS

A. INTRODUCTION

This chapter is included as background information for those who would use the regression equations in the future and who feel more comfortable with knowing how those equations were developed. Presented in this Chapter are the actual regression equations developed through use of the BMDP 2R and BMDP 9R regression programs. In those cases where the BMDP 2R program produced an equation with many variables, all of which exceeded the 95 percent confidence hurdle to enter by F-test, BMDP 9R was utilized to weed out the extraneous variables. The BMDP 9R All Possible SubSets Regression has the advantage of being able to define "best" subsets in terms of Mallows' Cp.[41] Mallows' Cp was used in BMDP 9R as a criterion along with the F-Tests in BMDP 2R to determine selections from the set of possible regression variables. When both the F-Test and Mallows' Cp failed to reduce the regressor variables down to a small number, the regression equation coefficient of Determination (Squared

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[41] Mallows' Cp = RSS/RMS - (N-2p') where RSS is the residual sum of squares based upon selected independent variables and RMS is the residual mean square based upon the regression using all independent variables. It is thus shown that the lower the Cp value, the less the error terms.

Multiple Correlation-SMC) was used in a fairly arbitrary fashion. It was prefered to keep the SMC value above .95, though anything above .90 or even .85, would probably be considered quite satisfactory for predictive purposes. The prefered number of regressor variables was five or fewer though as may be seen in the remainder of this Chapter, five was frequently an optimistically low number. In every case, it was prefered to use lagged variables in the equations. The variable pool started with 33 variables previously listed and then was increased by an additional 93 variables by lagging each one of the primary 31 variables one, two and three months.[42] The remainder of the variables in the pool were composite variables, mainly cross-products, cross-divisions, additions and subtractions with both the primary variables and the lagged variables and a mix of the two types. The total number of variables in the pool from which the BMDP 2R and BMDP 9R programs could select was 250. Though only linear transformations of the data were made, there was a strong preference for untransformed variables. In all cases, no more than ten variables were considered acceptable. There were two reasons for this decision:

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[42] V1 lagged one month is shown as V1L1; lagged two months V1L2; lagged three months V1L3.

1. The additional variables were believed to explain only the peculiarities in the data sets for Fiscal Years 1979 and 1980. There was no indication that fine-tuning the equations on historical data would have any utility in predictions using future data sets.

2. The problem of technology transfer limited the model to those which could easily be used with little training. The Texas Instruments TI-59 Programmable Calculator has only ten lettered registers that would be simple for clerical personnel to use (A through E and A' through E'), and it was decided early in the technology transfer effort to use a readily available and inexpensive calculator such as the TI-59.

B. REGRESSION EQUATIONS BY VARIABLE

The equations in the following pages describe each one of the SASSY variables identified and defined in Chapter II. Using V4 as an example, the equation would be read as

$$V4 = -2.86727 + 1.41675(V22) + .111965(V33) + .0004511(V18L2)$$

1. V1--Complete Fill Rate

MALLOWS' CP	8.11
SQUARED MULTIPLE CORRELATION	.98797
MULTIPLE CORRELATION	.99397
ADJUSTED SQUARED MULT. CORR.	.98149
RESIDUAL MEAN SQUARE	.409342
STANDARD ERROR OF ESTIMATE	.639798
F-STATISTIC	152.51
NUMERATOR DEG. OF FREEDOM	7
DENOMINATOR DEG. OF FREEDOM	13

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	61.1616	5.63396	13.005	10.86
V15	.000686095	.0000457358	.641	15.86
V17	.370688	.0410925	.460	9.02
V29	-.00216137	.000143157	-.782	-15.10
*V101	-2.27683	.334367	-.303	-6.81
V5L1	-.000313168	.000116596	-.138	-2.69
V5L2	-.000329035	.000127650	-.153	-2.58
V7L1	-.000618333	.000180242	-.186	-4.43

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	.40934184
AVERAGE DELETED RESIDUAL	.0235
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	.55089652
SERIAL CORRELATION	-.2706
DURBIN-WATSON STATISTIC	2.5104

* V101 = V11/V12

2. V2--RO Fill Rate

MALLOWS' CP	3.06
SQUARED MULTIPLE CORRELATION	.90879
MULTIPLE CORRELATION	.95330
ADJUSTED SQUARED MULT. CORR.	.86970
RESIDUAL MEAN SQUARE	2.207152
STANDARD ERROR OF ESTIMATE	1.485649
F-STATISTIC	23.25
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	75.4315	2.27481	18.328	33.16
V16	.000724738	.000118843	.752	6.10
V21	.000577944	.000143682	.461	4.02
V28	-.00191684	.000431988	-.580	-4.44
V29	-.00232352	.000246975	-.960	-9.41
V30	.00448481	.00184351	.842	2.43
* V109	-.00420916	.00141401	-1.076	-2.98

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	2.20715228
AVERAGE DELETED RESIDUAL	.1078
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	3.45362346
SERIAL CORRELATION	-0.3443
DURBIN-WATSON STATISTIC	1.9962

* V109 = V30 + V31

3. V3--Number of Nationial Stock NUmbers On Hand

MALLOWS' CP	3.34
SQUARED MULTIPLE CORRELATION	.98719
MULTIPLE CORRELATION	.99357
ADJUSTED SQUARED MULT. CORR.	.98398
RESIDUAL MEAN SQUARE	114832.666048
STANDARD ERROR OF ESTIMATE	338.869689
F-STATISTIC	308.21
NUMERATOR DEG. OF FREEDOM	4
DENOMINATOR DEG. OF FREEDOM	16

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	1967.91	2509.28	.735	.78
V21	0.938543	.0272726	1.151	34.41
V7	.645335	.0551511	.409	11.70
V9	63.5584	15.6133	.157	4.07
V2L3	-42.6741	23.4578	-.057	-1.82

AVERAGE RESIDUAL	-.00000
RESIDUAL MEAN SQUARE	114832.66604762
AVERAGE DELETED RESIDUAL	-15.7207
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	162507.99379020
SERIAL CORRELATION	-.01190
DURBIN-WATSON STATISTIC	2.2027

4. V4--Dollar Value of NSN's on Hand

MALLOWS' CP	4.00
SQUARED MULTIPLE CORRELATION	.95572
MULTIPLE CORRELATION	.97761
ADJUSTED SQUARED MULT. CORR.	.94791
RESIDUAL MEAN SQUARE	.108623
STANDARD ERROR OF ESTIMATE	.329579
F-STATISTIC	122.32
NUMERATOR DEG. OF FREEDOM	3
DENOMINATOR DEG. OF FREEDOM	17

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	-2.86727	1.19748	-1.986	-2.39
V22	1.41675	.105577	.969	13.42
V33	.111965	.0156087	.481	7.17
V18L2	.000451100	.000107653	.363	4.19

AVERAGE RESIDUAL	-.0000
RESIDUAL MEAN SQUARE	.10862259
AVERAGE DELETED RESIDUAL	-.0211
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	.16228710
SERIAL CORRELATION	-.1115
DURBIN-WATSON STATISTIC	2.1324

5. V5--Number of NSN's with an RO

MALLOWS' CP	9.00
SQUARED MULTIPLE CORRELATION	.98412
MULTIPLE CORRELATION	.99203
ADJUSTED SQUARED MULT. CORR.	.97353
RESIDUAL MEAN SQUARE	99698.508422
STANDARD ERROR OF ESTIMATE	315.750706
F-STATISTIC	92.93
NUMERATOR DEG. OF FREEDOM	8
DENOMINATOR DEG. OF FREEDOM	12

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	1659.80	1826.13	.855	.91
V5L1	.455432	.0419624	.487	10.85
* V86	16284.6	1333.71	.558	12.21
V27	174.601	23.0295	.389	7.58
V13	-6.24312	.633013	-.541	-9.86
V30	1.01851	.125008	.406	8.15
V25L3	.0758910	.0177060	.196	4.29
V14L3	12.5111	3.06201	.195	4.09
V3L1	-.0694088	.0287384	-.096	-2.42

AVERAGE RESIDUAL	-.0000
RESIDUAL MEAN SQUARE	99698.50842174
AVERAGE DELETED RESIDUAL	50.1657
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	177873.69524223
SERIAL CORRELATION	-.6419
DURBIN-WATSON STATISTIC	3.1009

* V86 = V2L1/V31L3

6. V6--Dollar Value of NSN's with an RO

MALLOWS' CP	7.03
SQUARED MULTIPLE CORRELATION	.97563
MULTIPLE CORRELATION	.98774
ADJUSTED SQUARED MULT. CORR.	.96519
RESIDUAL MEAN SQUARE	.035665
STANDARD ERROR OF ESTIMATE	.188851
F-STATISTIC	93.43
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	10.3934	1.54311	10.268	6.74
V6L1	.236804	.0714821	.242	3.31
V9	-.0865559	.0106439	-.566	-8.13
V7	.000286745	.0000320823	.481	8.94
V9L2	-.0468520	.0124009	-.252	-3.78
* V101	-.2867580	.0770735	-.177	-3.72
**V98	-.000178628	.0000850388	-.148	-2.10

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	.03566457
AVERAGE DELETED RESIDUAL	-.0130
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	.04762512
SERIAL CORRELATION	-.4027
DURBIN-WATSON STATISTIC	2.7748

* V101 = V11/V12

** V98 = V3/V4

7. V7--Number of RO NSN's on Hand

MALLOWS' CP	7.00
SQUARED MULTIPLE CORRELATION	.95031
MULTIPLE CORRELATION	.97484
ADJUSTED SQUARED MULT. CORR.	.92902
RESIDUAL MEAN SQUARE	204368.171699
STANDARD ERROR OF ESTIMATE	452.070981
F-STATISTIC	44.63
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	31943.6	1598.94	18.825	19.98
V14	-16.2318	1.82012	-.645	-8.92
V24L3	-1559.20	162.921	-.602	-9.57
V30L3	-.990874	.176123	-.383	-5.63
V24	463.650	156.447	.178	2.96
V1	-71.9870	23.9387	-.200	-3.01
V31L2	-1.12124	.384504	-.227	-2.92

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	204368.17169856
AVERAGE DELETED RESIDUAL	294.0155
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	1022775.54593293
SERIAL CORRELATION	-.2652
DURBIN-WATSON STATISTIC	2.5292

8. V8--Dollar Value of NSN's

MALLOWS' CP	6.03
SQUARED MULTIPLE CORRELATION	.97817
MULTIPLE CORRELATION	.98903
ADJUSTED SQUARED MULT. CORR.	.96882
RESIDUAL MEAN SQUARE	.041906
STANDARD ERROR OF ESTIMATE	.204709
F-STATISTIC	104.57
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	-6.26942	.797107	-5.408	-7.87
V22	1.08883	.0695751	.928	15.65
V33	.158055	.0107968	.846	14.64
V18L2	.000562664	.0000707500	.563	7.95
V28L2	.000215928	.0000459789	.213	4.70
V24L2	- .210459	.0866539	-.118	-2.43
V30L2	-.000124711	.0000726576	-.071	-1.72

AVERAGE RESIDUAL	-.0000
RESIDUAL MEAN SQUARE	.04190588
AVERAGE DELETED RESIDUAL	-.0416
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	.09930018
SERIAL CORRELATION	-.2471
DURBIN-WATSON STATISTIC	2.4907

9. V9--Percent Availability of RO NSN's on Hand

MALLOWS' CP	7.73
SQUARED MULTIPLE CORRELATION	.94417
MULTIPLE CORRELATION	.97168
ADJUSTED SQUARED MULT. CORR.	.92024
RESIDUAL MEAN SQUARE	3.493905
STANDARD ERROR OF ESTIMATE	1.869199
F-STATISTIC	39.46
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	105.628	15.6778	15.959	6.74
V18L3	.00230512	.000505893	.379	4.56
V11L1	.00136763	.000184869	.497	7.40
V11L2	.00109071	.000240526	.352	4.53
V1L3	-.392624	.107671	-.263	-3.65
V2L2	-.454704	.150395	-.265	-3.02
V31L1	-.00357978	.00151031	-.182	-2.37

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	3.49390502
AVERAGE DELETED RESIDUAL	.1624
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	4.39817299
SERIAL CORRELATION	-.0811
DURBIN-WATSON STATISTIC	2.1617

10. V10--Receipts from Due

MALLOWS' CP	7.28
SQUARED MULTIPLE CORRELATION	.97898
MULTIPLE CORRELATION	.98944
ADJUSTED SQUARED MULT. CORR.	.96767
RESIDUAL MEAN SQUARE	179634.219147
STANDARD ERROR OF ESTIMATE	423.832773
F-STATISTIC	86.51
NUMERATOR DEG. OF FREEDOM	7
DENOMINATOR DEG. OF FREEDOM	13

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	33619.3	3387.38	14.263	9.92
V11L1	.723261	.0489135	.739	14.79
V9L3	-275.904	26.3893	-.598	-10.46
V2L1	-467.309	49.6570	-.768	-9.41
V1L1	462.855	44.2548	.879	10.46
V14L2	-21.0793	3.96961	-.265	-5.31
V19L2	-.0289094	.00981158	-.122	-2.95
V24L1	-458.099	177.873	-.127	-2.58

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	179634.21914693
AVERAGE DELETED RESIDUAL	-187.0189
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	741241.87052495
SERIAL CORRELATION	.1535
DURBIN-WATSON STATISTIC	1.6314

11. <u>V11--Number of NSN's With Dues</u>

MALLOWS' CP	6.16
SQUARED MULTIPLE CORRELATION	.94559
MULTIPLE CORRELATION	.97242
ADJUSTED SQUARED MULT. CORR.	.91630
RESIDUAL MEAN SQUARE	419752.978326
STANDARD ERROR OF ESTIMATE	647.883460
F-STATISTIC	32.28
NUMERATOR DEG. OF FREEDOM	7
DENOMINATOR DEG. OF FREEDOM	13

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	3005.02	1641.44	1.342	1.83
V30	3.08910	.234671	1.066	13.16
V21	-.293305	.0497781	-.430	-5.89
V13L2	-3.46692	.874846	-.298	-3.96
V30L3	1.35617	.247971	.397	5.47
V15L1	.112824	.0371556	.222	3.04
V30L1	.806182	.243480	.249	3.31
V10L3	.235895	.0898720	.213	2.62

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	419752.97832574
AVERAGE DELETED RESIDUAL	-63.7996
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	654438.29917874
SERIAL CORRELATION	.0319
DURBIN-WATSON STATISTIC	1.8048

12. V12--Dollar Value of NSN's with Dues

MALLOWS' CP	5.91
SQUARED MULTIPLE CORRELATION	.96786
MULTIPLE CORRELATION	.98380
ADJUSTED SQUARED MULT. CORR.	.95409
RESIDUAL MEAN SQUARE	30033.964665
STANDARD ERROR OF ESTIMATE	173.303101
F-STATISTIC	70.27
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	-5415.79	989.935	-6.696	-5.47
V30	1.06306	.0616741	1.016	17.24
V12L1	.873833	.0746806	.826	11.70
V10	-.0971666	.0203082	-.283	-4.78
V9L3	66.6277	11.7705	.421	5.66
V15L3	.0586278	.0130743	.305	4.48
*V99	-.353828	.111574	-.246	-3.17

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	30033.96466544
AVERAGE DELETED RESIDUAL	5.8646
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	49457.94693316
SERIAL CORRELATION	-.1969
DURBIN-WATSON STATISTIC	2.2594

* V99 = V5/V6

13. V13--Number of NSN's With Excess Dues Over Req + ERQ

MALLOWS' CP	1.54
SQUARED MULTIPLE CORRELATION	.89965
MULTIPLE CORRELATION	.94850
ADJUSTED SQUARED MULT. CORR.	.86621
RESIDUAL MEAN SQUARE	3789.053051
STANDARD ERROR OF ESTIMATE	61.555285
F-STATISTIC	26.90
NUMERATOR DEG. OF FREEDOM	5
DENOMINATOR DEG. OF FREEDOM	15

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	511.388	449.497	3.039	1.14
V11	.0611725	.00665563	.814	9.19
V17L1	-13.4685	2.55816	.480	-5.26
V7L2	.0499019	.0140094	.347	3.56
V5	-.0216841	.00750402	-.250	-2.89
V14L2	1.14466	.554045	.201	2.07

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	3789.05305149
AVERAGE DELETED RESIDUAL	.9872
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	5074.29841882
SERIAL CORRELATION	-.7913
DURBIN-WATSON STATISTIC	3.5349

14. V14--Dollar Value of NSN's with Excess Dues Over RO + ERO

MALLOWS' CP	2.27
SQUARED MULTIPLE CORRELATION	.56733
MULTIPLE CORRELATION	.75321
ADJUSTED SQUARED MULT. CORR.	.49097
RESIDUAL MEAN SQUARE	2312.781513
STANDARD ERROR OF ESTIMATE	48.091387
F-STATISTIC	7.43
NUMERATOR DEG. OF FREEDOM	3
DENOMINATOR DEG. OF FREEDOM	

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	706.390	307.746	10.480	2.30
V2	-5.02149	2.62305	- .307	-1.91
V7	- .0145920	.00873639	- .367	-1.67
* V117	8.15512	5.08085	.353	1.61

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	2312.78151325
AVERAGE DELETED RESIDUAL	4.2713
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	5160.75020309
SERIAL CORRELATION	- .3614
DURBIN-WATSON STATISTIC	2.2250

* V117 = V2L3 - V1L3

15. V15--Total Demands

MALLOWS' CP	6.00
SQUARED MULTIPLE CORRELATION	.96865
MULTIPLE CORRELATION	.98420
ADJUSTED SQUARED MULT. CORR.	.95819
RESIDUAL MEAN SQUARE	807277.776588
STANDARD ERROR OF ESTIMATE	898.486381
F-STATISTIC	92.68
NUMERATOR DEG. OF FREEDOM	5
DENOMINATOR DEG. OF FREEDOM	15

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	-607.661	1856.46	-.138	-.33
V16	1.02486	.0545781	.996	18.78
V16L3	.326338	.0525567	.310	6.21
V11L1	-.478515	.0859244	-.262	-5.57
V10L3	.479293	.123260	.220	3.89
V24	798.400	327.064	.118	2.44

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	807277.77658777
AVERAGE DELETED RESIDUAL	154.4894
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	1129771.54675278
SERIAL CORRELATION	- .0729
DURBIN-WATSON STATISTIC	2.0812

16. V16--Number of Demands for RO Items

MALLOWS' CP	9.00
SQUARED MULTIPLE CORRELATION	.97302
MULTIPLE CORRELATION	.98642
ADJUSTED SQUARED MULT. CORR.	.95503
RESIDUAL MEAN SQUARE	819596.423594
STANDARD ERROR OF ESTIMATE	905.315649
F-STATISTIC	54.09
NUMERATOR DEG. OF FREEDOM	8
DENOMINATOR DEG. OF FREEDOM	12

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	143857.	7951.28	33.696	18.09
X23	-2.20757	.670150	-.249	-3.29
V27	-578.088	57.2033	-.585	-10.11
V13L1	-10.7634	1.41964	-.457	-7.58
V16L2	-.542099	.0602945	-.536	-8.99
V5L1	.785076	.128612	.381	6.10
V23L1	-3.85705	.667357	-.485	-5.78
*V101	-1714.29	441.478	-.251	-3.88
V25L1	.167481	.0581434	.182	2.88

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	819596.42359369
AVERAGE DELETED RESIDUAL	28.9325
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	1169631.61528166
SERIAL CORRELATION	- .2952
DURBIN-WATSON STATISTIC	2.5432

* V101 = V11/V12

17. V17--Percent Demands for RO Items

MALLOWS' CP	7.00
SQUARED MULTIPLE CORRELATION	.96955
MULTIPLE CORRELATION	.98465
ADJUSTED SQUARED MULT. CORR.	.95649
RESIDUAL MEAN SQUARE	1.483140
STANDARD ERROR OF ESTIMATE	1.217842
F-STATISTIC	74.28
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	139.953	12.5648	23.970	11.14
V1	.912452	.122541	.735	7.45
V2	-.994049	.120470	-.701	-8.25
V10L3	-.00147595	.000158070	-.511	-9.34
V27	-.578154	.0971230	-.428	-5.95
V12L2	.00216739	.000602573	.265	3.60
V31L3	-.00360191	.00101898	-.187	3.53

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	1.48314007
AVERAGE DELETED RESIDUAL	-.2047
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	2.63340180
SERIAL CORRELATION	.1194
DURBIN-WATSON STATISTIC	1.7186

18. V18--Number of Backorders

MALLOWS' CP	2.76
SQUARED MULTIPLE CORRELATION	.89125
MULTIPLE CORRELATION	.94406
ADJUSTED SQUARED MULT. CORR.	.85500
RESIDUAL MEAN SQUARE	217389.019667
STANDARD ERROR OF ESTIMATE	466.249954
F-STATISTIC	24.59
NUMERATOR DEG. OF FREEDOM	5
DENOMINATOR DEG. OF FREEDOM	15

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	24839.8	1955.08	20.287	12.71
V27L1	-223.148	24.7443	-.851	-9.02
* V104	10.0056	1.75693	.544	5.69
**V57	768.614	179.022	.386	4.29
V11L3	-.153345	.0541717	-.259	-2.83
V22	-290.178	117.747	-.234	-2.46

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	217389.01966686
AVERAGE DELETED RESIDUAL	-132.0149
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	525277.73567500
SERIAL CORRELATION	- .1028
DURBIN-WATSON STATISTIC	1.9676

* V104 = V15/V30L2

** V57 = V2L1/V30

19. V19--Number of NSN's with an RO Requirement But Not on Order

MALLOWS' CP	1.60
SQUARED MULTIPLE CORRELATION	.67265
MULTIPLE CORRELATION	.82016
ADJUSTED SQUARED MULT. CORR.	.61489
RESIDUAL MEAN SQUARE	4606085.503993
STANDARD ERROR OF ESTIMATE	2146.179280
F-STATISTIC	11.64
NUMERATOR DEG. OF FREEDOM	3
DENOMINATOR DEG. OF FREEDOM	17

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	36035.2	4837.87	10.420	7.45
V29L2	-1.10536	.407520	-.382	-2.71
* V109	-1.09593	.462934	-.333	-2.37
**V99	-4.15124	.855622	-.674	-4.85

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	4606085.50399326
AVERAGE DELETED RESIDUAL	59.1885
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	5318726.32430368
SERIAL CORRELATION	.2952
DURBIN-WATSON STATISTIC	1.3957

* V109 = V30 + V31

** V99 = V5/V6

20. V20--Dollar Value of NSN's with an RO Requirement But Not on Order

MALLOWS' CP	4.32
SQUARED MULTIPLE CORRELATION	.98189
MULTIPLE CORRELATION	.99090
ADJUSTED SQUARED MULT. CORR.	.97585
RESIDUAL MEAN SQUARE	37809.698227
STANDARD ERROR OF ESTIMATE	194.447161
F-STATISTIC	162.61
NUMERATOR DEG. OF FREEDOM	5
DENOMINATOR DEG. OF FREEDOM	15

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	352.293	703.463	.282	.50
V19	.112906	.00548657	.889	20.58
V25L2	.0374513	.0115279	.145	3.25
V30	-.128757	.0660902	-.080	-1.95
V25L3	.0486285	.0138582	.195	3.51
V26L3	-23.0693	10.1815	-1.09	-2.27

AVERAGE RESIDUAL	-.0000
RESIDUAL MEAN SQUARE	37809.69822727
AVERAGE DELETED RESIDUAL	-9.8965
AVE. SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	53450.97013857
SERIAL CORRELATION	- .4548
DURBIN-WATSON STATISTIC	2.8412

21. V21--Number of NSN's with 30 Day Usage

MALLOWS' CP	8.00
SQUARED MULTIPLE CORRELATION	.99928
MULTIPLE CORRELATION	.99964
ADJUSTED SQUARED MULT. CORR.	.99889
RESIDUAL MEAN SQUARE	12004.450225
STANDARD ERROR OF ESTIMATE	190.564822
F-STATISTIC	2566.27
NUMERATOR DEG. OF FREEDOM	7
DENOMINATOR DEG. OF FREEDOM	13

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	17528.9	948.217	5.336	18.49
V26	-263.773	6.32762	-.562	-41.69
V3	.356483	.0173532	.291	20.54
V4L1	246.458	34.9663	.103	7.05
V6	288.091	36.1747	.089	7.96
V30L2	.231188	.0478039	.427	4.84
V31L2	-.273807	.0929004	-.029	-2.95
V18L1	.0746693	.0226422	.028	3.30

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	12004.45022454
AVERAGE DELETED RESIDUAL	10.3959
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	21786.14478802
SERIAL CORRELATION	- .0584
DURBIN-WATSON STATISTIC	2.0941

22. V22--Dollar Values of NSN's on Hand Over RO + ERQ

MALLOWS' CP	8.51
SQUARED MULTIPLE CORRELATION	.98174
MULTIPLE CORRELATION	.99083
ADJUSTED SQUARED MULT. CORR.	.97191
RESIDUAL MEAN SQUARE	.027395
STANDARD ERROR OF ESTIMATE	.165513
F-STATISTIC	99.87
NUMERATOR DEG. OF FREEDOM	7
DENOMINATOR DEG. OF FREEDOM	13

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	-.467608	.743773	-.473	-.63
V21	.000188051	.0000170698	.625	11.02
*V98	-.000599290	.0000849237	-.509	-7.06
V10	.000111388	.0000186883	.266	5.96
**V109	.000247601	.0000430743	.264	5.75
V9L1	.0216771	.00980525	.133	2.21
V14L2	-.00379890	.00131607	-.114	-2.89
V3L1	.0000288872	.0000192129	.078	1.50

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	.02739467
AVERAGE DELETED RESIDUAL	.0188
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	.07747951
SERIAL CORRELATION	-.3047
DURBIN-WATSON STATISTIC	2.2842

* V98 =

** V109 = V30 + V31

23. V23--Number of NSN's With 30 Day Usage

MALLOWS' CP	7.16
SQUARED MULTIPLE CORRELATION	.91875
MULTIPLE CORRELATION	.95852
ADJUSTED SQUARED MULT. CORR.	.86459
RESIDUAL MEAN SQUARE	31317.449791
STANDARD ERROR OF ESTIMATE	176.967369
F-STATISTIC	16.96
NUMERATOR DEG. OF FREEDOM	8
DENOMINATOR DEG. OF FREEDOM	12

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	3186.64	1837.97	6.626	1.73
V23L1	.548587	.107953	.612	5.08
* V107	.210918	.0344162	.660	6.13
V18L1	-.129389	.0381725	-.332	-3.39
V2L2	22.1545	13.8146	.178	1.60
V31L3	-.310327	.164314	-.195	-1.89
V5L3	.0668828	.0239540	.325	2.79
V31L2	-.376710	.149538	-.269	-2.52
V31L1	-.232279	.144040	-.163	-1.61

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	31317.44979051
AVERAGE DELETED RESIDUAL	34.3273
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	97723.61223853
SERIAL CORRELATION	-.1603
DURBIN-WATSON STATISTIC	2.3078

* V107 = V21/V22

24. V24--Dollar Value of NSN's with 30 Day Usage

MALLOWS' CP	8.01
SQUARED MULTIPLE CORRELATION	.96312
MULTIPLE CORRELATION	.98139
ADJUSTED SQUARED MULT. CORR.	.93853
RESIDUAL MEAN SQUARE	.026098
STANDARD ERROR OF ESTIMATE	.161548
F-STATISTIC	39.17
NUMERATOR DEG. OF FREEDOM	8
DENOMINATOR DEG. OF FREEDOM	12

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	1.34483	.583566	2.064	2.30
*V111	.000225756	.0000765169	.220	2.95
V11L2	-.000226155	.0000235459	-.742	-9.60
V14L2	.0122807	.00158893	.558	7.73
V6L2	.409747	.0746752	.658	5.49
V28L1	.000306717	.0000453082	.552	6.77
V16L2	-.000041351	.0000115364	-.268	-3.58
V6L1	-.274396	.0822456	-.436	-3.34
V18	-.000100363	.0000405766	-.189	-2.47

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	.02609761
AVERAGE DELETED RESIDUAL	.1070
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	.30069624
SERIAL CORRELATION	-.1372
DURBIN-WATSON STATISTIC	2.1487

*V111 = V30L1 - V31L1

25. V25--Warehouse Issue Confirms

MALLOWS' CP	5.51
SQUARED MULTIPLE CORRELATION	.90134
MULTIPLE CORRELATION	.94939
ADJUSTED SQUARED MULT. CORR.	.85906
RESIDUAL MEAN SQUARE	3021321.798640
STANDARD ERROR OF ESTIMATE	1738.194983
F-STATISTIC	21.32
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	-17625.1	10288.3	-3.807	-1.71
V16L3	.431501	.106779	.389	4.04
V18	1.90219	.349946	.503	5.44
V27	376.034	105.596	.351	3.56
V13L1	-11.5901	2.60320	-.454	-4.45
V18L3	1.07558	.418043	.253	2.57
V5	-.470501	.252233	-.197	-1.87

AVERAGE RESIDUAL	-.0000
RESIDUAL MEAN SQUARE	3021321.79863988
AVERAGE DELETED RESIDUAL	145.2117
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	3326576.75289341
SERIAL CORRELATION	- .0049
DURBIN-WATSON STATISTIC	2.0068

26. V26--Percent Total NSN's on Hand Which Have an RO

MALLOWS' CP	7.00
SQUARED MULTIPLE CORRELATION	.99829
MULTIPLE CORRELATION	.99915
ADJUSTED SQUARED MULT. CORR.	.99756
RESIDUAL MEAN SQUARE	.160697
STANDARD ERROR OF ESTIMATE	.400871
F-STATISTIC	1364.43
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	67.5050	4.25881	8.316	15.85
V21	-.002348221	.0000467728	- .950	-50.20
V7	.001300941	.0000595198	.272	21.86
V8L1	.795976	.149408	.108	5.33
V2L3	.0852620	.0267829	.037	3.18
V5L5	.000173932	.0000518695	.047	3.35
V23	-.000547316	.000201415	-.032	-2.72

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	.16069721
AVERAGE DELETED RESIDUAL	.0178
AVERAGE SQUARED DELETED RESIDUAL	.23446216
(PREDICTION MEAN SQUARE)	-.1607
SERIAL CORRELATION	2.2740
DURBIN-WATSON STATISTIC	

27. V27--Percent of the Total Value of NSN's on Hand Which Have an RO

MALLOWS' CP	4.06
SQUARED MULTIPLE CORRELATION	.87189
MULTIPLE CORRELATION	.93375
ADJUSTED SQUARED MULT. CORR.	.82919
RESIDUAL MEAN SQUARE	3.185242
STANDARD ERROR OF ESTIMATE	1.784725
F-STATISTIC	20.42
NUMERATOR DEG. OF FREEDOM	5
DENOMINATOR DEG. OF FREEDOM	15

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	93.6388	14.9675	21.684	6.26
V20	-.00162900	.000813371	- .204	-2.00
V5	.00145372	.000276476	.653	5.26
*V90	-29.8534	7.69101	- .454	-3.88
V3	-.000819186	.000169731	- .508	-4.83
V9L3	-.348726	.0969697	-.413	-3.60

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	3.18524243
AVERAGE DELETED RESIDUAL	-.0229
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	3.56759904
SERIAL CORRELATION	-.0317
DURBIN-WATSON STATISTIC	1.9893

* V90 = V2L3/V31L3

28. V28--Regular and Hot Item Backorders Released

MALLOWS' CP	6.11
SQUARED MULTIPLE CORRELATION	.95844
MULTIPLE CORRELATION	.97900
ADJUSTED SQUARED MULT. CORR.	.93607
RESIDUAL MEAN SQUARE	99300.469606
STANDARD ERROR OF ESTIMATE	315.119770
F-STATISTIC	42.83
NUMERATOR DEG. OF FREEDOM	7
DENOMINATOR DEG. OF FREEDOM	13

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	9274.22	1733.55	7.442	5.35
V2L1	-381.716	31.0460	-1.186	-12.30
V1L1	416.795	30.0625	1.498	13.86
V31L1	1.71185	.243729	.463	7.02
V16	.185293	.0228301	.635	8.12
V18	-.550407	.0706189	-.541	-7.97
V28L3	.244920	.0660787	.220	3.71
V1	-67.2197	20.5138	-.254	-3.28

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	99300.46960555
AVERAGE DELETED RESIDUAL	43.1228
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	183358.47274424
SERIAL CORRELATION	-.0744
DURBIN-WATSON STATISTIC	2.0587

29. V29--Regular and Hot Item Backorders Established

MALLOWS' CP	11.00
SQUARED MULTIPLE CORRELATION	.99580
MULTIPLE CORRELATION	.99790
ADJUSTED SQUARED MULT. CORR.	.99160
RESIDUAL MEAN SQUARE	24324.142246
STANDARD ERROR OF ESTIMATE	155.961990
F-STATISTIC	236.96
NUMERATOR DEG. OF FREEDOM	10
DENOMINATOR DEG. OF FREEDOM	10

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	25460.5	2128.96	14.966	11.96
V26L1	-41.9239	6.97141	-.184	-6.01
V2	-264.662	11.3641	-.640	-23.29
V16	.263048	.0104603	.660	25.15
V7L3	.221060	.0457517	.157	4.83
V13	-2.09955	.254625	-.208	-8.25
V7L1	-.359601	.0383247	-.299	-9.38
V2L1	135.775	16.9365	.309	8.02
V1L1	-146.221	16.2073	-.385	-9.02
V29L2	.222793	.0437317	.156	5.09
V16L3	-.0361171	.0119469	-.089	-3.02

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	24324.14224575
AVERAGE DELETED RESIDUAL	12.1606
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	40923.24922145
SERIAL CORRELATION	-.1558
DURBIN-WATSON STATISTIC	2.2650

30. V30--AOA Dollar Value

MALLOWS' CP	6.71
SQUARED MULTIPLE CORRELATION	.96942
MULTIPLE CORRELATION	.98459
ADJUSTED SQUARED MULT. CORR.	.95632
RESIDUAL MEAN SQUARE	26109.091821
STANDARD ERROR OF ESTIMATE	161.583080
F-STATISTIC	73.98
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	3619.52	780.103	4.682	4.64
V12	.697306	.0638353	.729	10.92
V12L1	-.757721	.0642865	-.749	-11.79
* V120	-755120	108959	-.471	-6.93
V11	.131346	.0223416	.380	5.88
** V108	-.0971516	.0227252	-.205	-4.28
V7L1	-.102330	.0293969	-.188	-3.48

AVERAGE RESIDUAL	-.0000
RESIDUAL MEAN SQUARE	26109.09182087
AVERAGE DELETED RESIDUAL	-18.9697
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	34618.27506847
SERIAL CORRELATION	-.2078
DURBIN-WATSON STATISTIC	2.3287

* V120 = V2L3/V31L2/V30L1

** V108 = V23/V24

31. V31--A3A Dollar Value

MALLOWS' CP	7.00
SQUARED MULTIPLE CORRELATION	.96100
MULTIPLE CORRELATION	.98031
ADJUSTED SQUARED MULT. CORR.	.94428
RESIDUAL MEAN SQUARE	8956.298228
STANDARD ERROR OF ESTIMATE	94.637721
F-STATISTIC	57.49
NUMERATOR DEG. OF FREEDOM	6
DENOMINATOR DEG. OF FREEDOM	14

VARIABLE NUMBER	REGRESSION COEFFICIENT	STANDARD ERROR	STD COEFF	T-STATISTIC
INTERCEPT	4343.76	776.630	10.834	5.59
V7	-.114863	.0168075	-.486	-6.83
V32	114.582	8.17176	.936	14.02
* V53	-394.396	44.6577	-.543	-8.83
V7L3	-.0972461	.0252611	-.293	-3.85
V13L2	.704710	.125038	.338	5.64
V30L3	.0907402	.0388288	.149	2.34

AVERAGE RESIDUAL	.0000
RESIDUAL MEAN SQUARE	8956.29822823
AVERAGE DELETED RESIDUAL	-.4944
AVERAGE SQUARED DELETED RESIDUAL (PREDICTION MEAN SQUARE)	12884.80045932
SERIAL CORRELATION	-.2007
DURBIN-WATSON STATISTIC	2.3848

*V53 = V2/V30

C. SUMMARY

The equations presented on the preceding pages of this chapter are remarkable because of their high coefficient of determination (squared multiple correlation) values. These values do not in themselves guarantee predictive power, but they do indicate how well the independent variables explain the variance in the dependent variables. It is again pointed out that the data used were those obtained from the SASSY Management Unit and that they were left in their original states with the exception of the few linear transformations that are shown with the regression equations that used them. For example, V101 is a linear transformation of V11 and V12; V101 = V11/V12. The data have been left to speak for themselves, and if an equation is not a good predictor, then it was because the data could not support a prediction.

V. TESTING THE MODELS

A. INTRODUCTION

In Chapter IV, the models were introduced with the hopes that they might prove to be accurate enough to be useful. They are tested in this chapter against actual SASSY data from the first and second quarters of Fiscal Year 1981. At the time of this writing, only five months of FY 81 data were available, but they are adequate to show the predictive powers of the various models. Notice that in many cases, the models are asked to make predictions with data from outside their normal operating ranges, or they are asked to make out of range predictions from data within range.

B. EXTRAPOLATION

To better show the frequent extrapolation, the "data base" means for each independent predictior variable and each dependent variable is shown at the bottom of the table of data used in prediction. Note the wide ranges even within given variables. Some error is naturally introduced through round-off error.[43] These errors are best seen when

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[43] This comment applies to the recording and presentation of data as well as to the equations themselves.

comparing the dependent variables' data base means against the predictions of those variables from the data base means of the predictor variables. With very few exceptions, the models provide nearly identical values. The user of the models is cautioned again that unless the predictor variable values come from within the joint region of the original data as described in Figure &JOINT, the confidence in the predictions is greatly diminished.

The suggested method for determining whether a predictor variable is "stretching" the model or not is to see whether it is singly within the original range of that variable. This is but a rule-of-thumb as it is conceivable that, with the limited number of monthly data sets (24 months), the caution of having all variables within the original data's joint region, as per Figure 3, may not be met. Without resorting to the tedious task of going through each of the original data sets, it is just assumed that the models will be within range if the dependent variable and independent variables are between the smallest and largest values of the data base. For convenience, the range for each variable is shown in Table 3.

Table 3

Range of Values of Data Base Variables

	LOW	HIGH		LOW	HIGH
V1	50.0	67.0	V17	65	85
V2	65.7	79.9	V18	5032	9624
V3	24918	34367	V19	3889	13739
V4	4.5	8.5	V20	435	2319
V5	24387	30630	V21	7200	18601
V6	4.6	7.5	V22	1.0	4.0
V7	18017	24670	V23	12832	14626
V8	3.1	6.8	V24	1.3	4.4
V9	66.7	89.0	V24	15642	33305
V10	395	10810	V26	59.0	88.0
V11	1933	9241	V27	66.0	80.0
V12	1714	4765	V28	2221	6534
V13	326	890	V29	3936	9957
V14	69	398	V30	28	2752
V15	20540	37135	V31	259	1762
V16	15221	31574			

C. ROBUSTNESS OF THE MODELS

As seen in the various tests following, most models are quite robust except where the values of the predictor variables are small and the "standardized coefficients" for those variables are large. The model descriptions in Chapter IV show the standardized coefficients in addition to the regression coefficients. Those models, wherein the intercept value has a large standardized coefficient and the predictor variables have relatively small standardized coefficients, are comparatively insensitive to a given predictor variable being out of range. In evaluating the performance of a model, it is recommended that the errors in prediction be evaluated in light of the coefficient of

variation for the independent variable, the range of the independent variable and the Appendix B graphs of the data base. For example, when a given model predicts within thirty percent of the actual value, this may be considered a useful model if the variability and range for that variable are large and the model gives a "ball park" prediction otherwise not obtainable.

D. TESTS OF THE MODELS BY VARIABLE

The predicted values in this section are compared with the actual values. The predictions are presented along with the data that were used in making the predictions. The purpose for showing so many tables and so much data is to give the reader confidence in the quality of the equations and their predictive power. Remember that the equations do not represent how things should be but rather how they have been in the past. Note the "%" column to the right side of the predicted and actual values. The percentages shown are the differences between the predicted and the actual values expressed as a percentage of the actual value. In other words, in the first case, the predicted value of V1 for October over-stated the actual value by 17.1% of the actual value. Because the individual predictions are subject to random error (normally distributed random error), the real

test of the equation is in seeing just how close a sample to the actual data sample it can generate. The statistics are are given for the five months data available and also for the 1st four months. Many of the funding decisions in the Marine Corps are made on the basis of periodic data. In many of the cases where the four month data differ significantly from the five month data, it is because the model was asked to predict outside of its range. To provide an instant view of how close to the data base means the independent variables' values are, the bottom line in each of the "Data Used in Predictions" blocks gives the data base mean for the individual variables. Using V1 as an example again, it can be seen that the February value of V11 is less than half of its data base mean. Other variables, such as V31, have more dramatic variances from their data base means. The February value of V30, used in predicting V31, is but 27 (in thousands) while the data base mean is 923 (in thousands); this kind of variance from the measure of central tendency of the data base mean for V30 is likely to push the model into very strange predictions. In this case, the model's prediction of -1.6 (in thousands) was very much off the actual value of 1042 (in thousands). The robustness

of the model can be seen in the fact that the predicted mean for the 1st Quarter was only 12.3% over the actual value.

1. V1--Complete Fill Rate

	PREDICTED	ACTUAL	%
OCT, FY 81	57.4	49.0	17.1
NOV, FY 81	60.7	57.3	5.9
DEC, FY 81	68.8	64.2	7.2
JAN, FY 81	57.8	52.0	11.2
FEB, FY 81	69.3	66.1	4.8

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	62.8	59.6	3.3
STD. DEV. FIVE MONTHS	5.9	7.4	
MEANS FOR 1ST FOUR MONTHS	61.1	55.6	4.2
STD. DEV. 1ST FOUR MONTHS	5.3	6.7	

DATA USED IN PREDICTIONS

MONTH	V15	V17	V29	V11	V12
OCT	21852	72.0	5821	9057	4705
NOV	24331	73.0	5814	7883	4222
DEC	44305	76.0	7983	7828	3700
JAN	23594	69.0	5481	5931	3738
FEB	34676	77.0	5476	2982	2434
MEANS	28114	73.9	6165	6675	3129

MONTH	V5L1	V5L2	V7L1		
OCT	27024	27078	18017		
NOV	26757	27024	18616		
DEC	26842	26757	18896		
JAN	26627	26842	20291		
FEB	25705	26627	20131		
MEANS	27543	27409	22378		

V1 Data base mean 58.1428
V1 predicted from data base means 58.1818

2. V2--RO Fill Rate

	PREDICTED	ACTUAL	%
OCT, FY 81	75.0	63.0	19.0
NOV, FY 81	75.9	73.4	3.4
DEC, FY 81	71.1	79.9	-11.0
JAN, FY 81	75.2	68.9	9.1
FEB, FY 81	80.9	80.6	.4

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	75.6	73.2	8.8
STD. DEV. FIVE MONTHS	3.5	7.5	
MEANS FOR 1ST FOUR MONTHS	74.3	71.3	9.9
STD. DEV. 1ST FOUR MONTHS	2.2	7.1	

DATA USED IN PREDICTIONS

MONTH	V16	V21	V28	V29	V30
OCT	15731	17089	3334	5821	1265
NOV	17699	18615	4942	5184	843
DEC	33605	18702	6446	7983	1200
JAN	16288	19615	3841	5481	827
FEB	26697	20287	4452	5476	1042
MEANS	20696	12599	4092	6165	923

MONTH	V31				
OCT	507				
NOV	428				
DEC	1974				
JAN	826				
FEB	1042				
MEANS	786				

V2 Data base mean 72.4904
V2 predicted from data base means 72.4905

3. V3--Number of NSN's on Hand

	PREDICTED	ACTUAL	%
OCT, FY 81	31051	31217	-.5
NOV, FY 81	33074	33139	-.2
DEC, FY 81	34655	34643	.03
JAN, FY 81	35473	35489	.2
FEB, FY 81	35780	36382	-1.7

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	34006	34174	-.5
STD. DEV. FIVE MONTHS	1957	2040	
MEANS FOR 1ST FOUR MONTHS	33563	33622	-.2
STD. DEV. 1ST FOUR MONTHS	1948	1875	

DATA USED IN PREDICTIONS

MONTH	V21	V7	V9	V2L3	
OCT	17089	18616	69.5	79.5	
NOV	18615	18896	70.4	71.1	
DEC	18702	20291	76.2	65.7	
JAN	19615	20131	75.4	63.0	
FEB	20287	20151	77.1	73.4	
MEANS	12599	22219	80.0		

V3 data base mean 30129.41
V3 predicted from data base means 30129.41

4. V4--Dollar Value of NSN's on Hand

	PREDICTED	ACTUAL	%
OCT, FY 81	10.4	10.6	-1.9
NOV, FY 81	13.1	11.4	14.9
DEC, FY 81	11.9	10.7	11.2
JAN, FY 81	12.8	11.3	13.3
FEB, FY 81	12.7	11.5	10.4

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	12.3	11.1	10.8
STD. DEV. FIVE MONTHS	1.1	.42	
MEANS FOR 1ST FOUR MONTHS	12.1	11.0	10.0
STD. DEV. 1ST FOUR MONTHS	1.2	.41	

DATA USED IN PREDICTIONS

MONTH	V22	V33	V18L2		
OCT	4.8	37	5229		
NOV	5.2	38	9624		
DEC	4.8	39	7960		
JAN	5.1	40	8859		
FEB	5.2	41	8021		
MEANS	2.2	26	7224		

V4 Data base mean	6.4667
V4 Predicted from data base means	6.4667

5. V5--Number NSN's with an RO

	PREDICTED	ACTUAL	%
OCT, FY 81	28377	26757	6.1
NOV, FY 81	25362	26842	-5.5
DEC, FY 81	32603	26627	2.6
JAN, FY 81	31333	26705	5.5
FEB, FY 81	27941	26143	7.5

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	29123	26675	9.4
STD. DEV. FIVE MONTHS	2876	275	
MEANS FOR 1ST FOUR MONTHS	29149	26733	10.0
STD. DEV. 1ST FOUR MONTHS	3232	90	

DATA USED IN PREDICTIONS

MONTH	V5L1	V2L1	V31L2	V27	V13
OCT	27024	65.7	453	79.0	630
NOV	26757	63.0	1762	78.0	679
DEC	26842	73.4	507	79.0	475
JAN	26627	79.9	428	77.0	516
FEB	26705	68.9	1974	77.0	408
MEANS	27542.9	73.0	719.0	74.4	572.5

MONTH	V30	V25L3	V14L3	V3L1	
OCT	1265	20309	119	30694	
NOV	843	21727	97	31217	
DEC	1200	21495	398	33139	
JAN	827	17191	363	34643	
FEB	27	13148	327	35489	
MEANS	922.8	21110.3	113.7	30145.9	

V5 Data base mean 27673.3164
V5 predicted from data base means 24046.9889

6. V6--Dollar Value of NSN's with an RO

	PREDICTED	ACTUAL	%
OCT, FY 81	6.9	7.1	-2.8
NOV, FY 81	7.2	8.3	-13.3
DEC, FY 81	7.1	7.4	-4.1
JAN, FY 81	7.1	8.3	-14.5
FEB, FY 81	7.4	9.0	-17.8

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	7.2	7.1	12.5
STD. DEV. FIVE MONTHS	.2	.4	
MEANS FOR 1ST FOUR MONTHS	7.1	7.8	-9.0
STD. DEV. 1ST FOUR MONTHS	.1	.6	

DATA USED IN PREDICTIONS

MONTH	V6L1	V9	V7	V9L2	V11
OCT	6.5	69.6	18616	68.9	9057
NOV	7.1	70.4	18896	66.7	7883
DEC	8.3	76.2	20291	69.6	7828
JAN	7.4	75.4	20131	70.4	5931
FEB	8.3	77.1	20151	76.2	2982
MEANS	5.8	80.3	22219	82.2	6675

MONTH	V12	V3	V4		
OCT	4705	31217	10.6		
NOV	4222	33139	11.4		
DEC	3700	34643	10.7		
JAN	3738	35489	11.3		
FEB	2434	36382	11.5		
MEANS	3129	30129	6.5		

V6 Data base mean 5.8524
V6 Predicted from data base means 5.8863

7. V7--Number of NSN's with an RO on Hand

	PREDICTED	ACTUAL	%
OCT, FY 81	19604	18616	5.3
NOV, FY 81	19206	18896	1.6
DEC, FY 81	17682	20291	-12.9
JAN, FY 81	20289	20131	.8
FEB, FY 81	19228	20151	-4.6

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	19202	19617	-2.1
STD. DEV. FIVE MONTHS	956	795	
MEANS FOR 1ST FOUR MONTHS	19195	19484	-1.5
STD. DEV. 1ST FOUR MONTHS	1104	850	

DATA USED IN PREDICTIONS

MONTH	V14	V24L3	V30L3	V24	V1
OCT	363	1.8	444	1.8	49.0
NOV	327	1.4	28	1.9	57.3
DEC	282	1.8	2452	1.6	64.2
JAN	262	1.8	1265	1.9	52.0
FEB	177	1.9	843	2.0	66.1
MEANS	129	1.6	915	1.6	58.1

MONTH	V31L2				
OCT	453				
NOV	1762				
DEC	507				
JAN	428				
FEB	1974				
MEANS	719				

V7 Data base mean 22219.0352
V7 Predicted from data base means 22219.0908

8. V8--Dollar Value of RO NSN's on Hand

	PREDICTED	ACTUAL	%
OCT, FY 81	10.6	8.4	25.2
NOV, FY 81	9.7	8.9	9.0
DEC, FY 81	10.3	8.4	22.6
JAN, FY 81	10.7	8.7	23.0
FEB, FY 81	11.2	8.9	25.8

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	10.5	8.7	20.7
STD. DEV. FIVE MONTHS	.6	.3	
MEANS FOR 1ST FOUR MONTHS	8.6	10.3	16.5
STD. DEV. 1ST FOUR MONTHS	.3	.5	

DATA USED IN PREDICTIONS

MONTH	V22	V33	V18L2	V28L2	V3012
OCT	4.8	37	9624	2929	28
NOV	5.2	38	7960	2221	2452
DEC	4.8	39	8859	3334	1265
JAN	5.1	40	8021	4942	843
FEB	5.2	41	7907	6446	1200
MEANS	2.2		7224	4291	897

MONTH	V24L2				
OCT	1.4				
NOV	1.8				
DEC	1.8				
JAN	1.8				
FEB	1.9				
MEANS	1.6				

V8 Data base mean 4.8095
V8 predicted from data base means 4.8095

9. V9--Percent Availability of RO NSN's on Hand

	PREDICTED	ACTUAL	%
OCT, FY 81	69.6	69.6	0
NOV, FY 81	96.9	70.4	37.6
DEC, FY 81	94.8	76.2	24.4
JAN, FY 81	85.7	75.4	13.7
FEB, FY 81	79.0	77.1	2.5

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	85.2	73.7	15.6
STD. DEV. FIVE MONTHS	11.3	3.5	
MEANS FOR 1ST FOUR MONTHS	89.1	74.8	19.1
STD. DEV. 1ST FOUR MONTHS	8.3	3.0	

DATA USED IN PREDICTIONS

MONTH	V18L3	V11L1	V11L2	V2L2	V31L1
OCT	5229	8992	1933	71.1	1762
NOV	9624	9057	8992	65.7	507
DEC	7960	7883	9057	63.0	428
JAN	8859	7828	7883	73.4	1974
FEB	8021	5931	7828	79.9	826
MEANS	7277	6784	7003	73.0	725

MONTH	V1L3				
OCT	60.7				
NOV	54.6				
DEC	50.0				
JAN	49.0				
FEB	57.3				
MEANS	59.2				

V9 Data base mean 80.2856
V9 predicted from data base means 80.2856

10. V10--Receipts from Due

	PREDICTED	ACTUAL	%
OCT, FY 81	8881	2602	241.3
NOV, FY 81	4952	4162	19.0
DEC, FY 81	4386	5989	-26.8
JAN, FY 81	4537	3163	43.4
FEB, FY 81	3305	3409	-3.1

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	5212	3265	34.9
STD. DEV. FIVE MONTHS	2139	2051	
MEANS FOR 1ST FOUR MONTHS	5689	3979	43.0
STD. DEV. 1ST FOUR MONTHS	2142	1487	

DATA USED IN PREDICTIONS

MONTH	V11L2	V9L3	V2L1	V1L1	V14L2
OCT	8992	74.0	65.7	50.0	97
NOV	9057	68.9	63.0	49.0	398
DEC	7883	66.7	73.4	57.3	363
JAN	7828	69.6	79.9	64.2	327
FEB	5931	70.4	68.9	52.0	282
MEANS	6784	82.6	73.0	58.8	115

MONTH	V19L2	V24L1			
OCT	13705	1.8			
NOV	8069	1.8			
DEC	7996	1.9			
JAN	10121	1.6			
FEB	8183	1.9			
MEANS	933	1.6			

V10 Data base mean 5410.8828
V10 predicted from data base means 5410.8424

11. V11--Number of NSN's with Dues

	PREDICTED	ACTUAL	%
OCT, FY 81	7488	9057	-17.3
NOV, FY 81	2530	7833	-67.7
DEC, FY 81	5606	7828	-28.4
JAN, FY 81	3494	5931	-41.1
FEB, FY 81	3282	2982	10.1

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	4480	6726	33.4
STD. DEV. FIVE MONTHS	2032	2373	
MEANS FOR 1ST FOUR MONTHS	4780	5912	-19.1
STD. DEV. 1ST FOUR MONTHS	2216	3625	

DATA USED IN PREDICTIONS

MONTH	V30	V21	V13L2	V30L3	V15L2
OCT	1265	17089	400	444	31879
NOV	843	18615	676	28	25650
DEC	1200	18702	630	2452	21852
JAN	827	19615	679	1265	24331
FEB	27	20287	475	843	44305
MEANS	923	12599	543	915	27721

MONTH	V30L1	V10L3			
OCT	2452	3384			
NOV	1265	3276			
DEC	843	395			
JAN	1200	2602			
FEB	827	4162			
MEANS	856	5683			

V11 Data base mean 6675.4141
V11 predicted from data base means 6675.4295

12. V12--Dollar Value of NSN's with Dues

	PREDICTED	ACTUAL	%
OCT, FY 81	4973	4705	5.7
NOV, FY 81	4503	4222	6.7
DEC, FY 81	3642	3700	-1.6
JAN, FY 81	3169	3738	-15.2
FEB, FY 81	2637	2434	8.3

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	3785	3760	.7
STD. DEV. FIVE MONTHS	954	847	
MEANS FOR 1ST FOUR MONTHS	4072	4091	-.5
STD. DEV. 1ST FOUR MONTHS	816	473	

DATA USED IN PREDICTIONS

MONTH	V30	V12L1	V10	V9L3	V15L3
OCT	1265	4283	2602	74.0	33376
NOV	843	4705	4162	68.9	31879
DEC	1200	4222	5989	66.7	25650
JAN	827	3700	3163	69.6	21852
FEB	27	3738	3409	70.4	24331
MEANS	923	3070	5411	82.6	27427

MONTH	V5	V6			
OCT	26757	7.1			
NOV	26842	8.3			
DEC	26627	7.4			
JAN	26705	8.3			
FEB	26143	9.0			
MEANS	27673	5.9			

V12 Data base mean 3128.5706
V12 predicted from data base means 3174.1726

13. V13--Number of NSN's w/Excess Dues Over Req

+ ERQ

	PREDICTED	ACTUAL	%
OCT, FY 81	569	630	-9.7
NOV, FY 81	837	679	23.3
DEC, FY 81	858	475	80.6
JAN, FY 81	650	516	26.0
FEB, FY 81	526	408	28.9

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	588	542	26.9
STD. DEV. FIVE MONTHS	152	111	
MEANS FOR 1ST FOUR MONTHS	729	575	26.8
STD. DEV. 1ST FOUR MONTHS	575	95	

DATA USED IN PREDICTIONS

MONTH	V11	V17L1	V7L2	V5	V14L2
OCT	9057	71.0	18616	26757	97
NOV	7883	72.0	18896	26842	398
DEC	7828	73.0	20291	26627	363
JAN	5931	76.0	20131	26705	327
FEB	2982	69.0	20151	26143	282
MEANS	6675	74.4	22497	27673	115

V13 Data base mean 572.4749
V13 predicted from data base means 571.8729

14. V14--Dollar Value of Excess NSN's Over Req + ERO

	PREDICTED	ACTUAL	%
OCT, FY 81	271	363	-25.3
NOV, FY 81	196	327	-40.1
DEC, FY 81	137	282	-51.04
JAN, FY 81	181	262	-31.0
FEB, FY 81	139	177	-21.5

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	145	282	-48.6
STD. DEV. FIVE MONTHS	92	71	
MEANS FOR 1ST FOUR MONTHS	196	309	-36.6
STD. DEV. 1ST FOUR MONTHS	56	45	

DATA USED IN PREDICTIONS

MONTH	V2	V7	V2L3	V1L3	
OCT	63.0	18616	79.5	60.7	
NOV	73.4	18896	71.1	54.6	
DEC	79.9	20291	65.7	50.0	
JAN	68.9	20131	63.0	49.0	
FEB	80.6	20151	73.4	57.3	
MEANS	72.5	22219	72.8	59.2	

V14 Data base mean 128.9523
V14 predicted from data base means 128.9530

15. V15--Total Demands

	PREDICTED	ACTUAL	%
OCT, FY 81	22012	21852	.7
NOV, FY 81	23603	24331	-3.0
DEC, FY 81	37437	44305	-16.0
JAN, FY 81	20237	23594	-14.2
FEB, FY 81	33282	34676	-4.0

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	27319	29752	-8.2
STD. DEV. FIVE MONTHS	7592	9562	
MEANS FOR 1ST FIVE MONTHS	25828	28521	-9.4
STD. DEV. 1ST FIVE MONTHS	7876	10574	

DATA USED IN PREDICTIONS

MONTH	V16	V16L3	V11L1	V10L3	V24
OCT	15731	23723	8992	3384	1.8
NOV	17699	22425	9057	3276	1.9
DEC	33605	18108	7883	395	1.6
JAN	16288	15731	7828	2602	1.9
FEB	26697	17699	5931	4162	2.0
MEANS	20696	20598	6784	5683	1.6

V15 Data base mean 28114.4570
V15 predicted from data base means 28114.3148

16. V16--Number of Demands for RO Items

	PREDICTED	ACTUAL	%
OCT, FY 81	15116	15731	-3.9
NOV, FY 81	13751	17699	-22.3
DEC, FY 81	12597	33605	-62.5
JAN, FY 81	16394	16288	.7
FEB, FY 81	6238	26697	-76.6

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	12819	22004	-41.7
STD. DEV. FIVE MONTHS	3946	7861	
MEANS FOR 1ST FOUR MONTHS	14465	20831	-30.6
STD. DEV. 1ST FOUR MONTHS	1648	8556	

DATA USED IN PREDICTIONS

MONTH	V23	V27	V13L3	V16L2	V5L1
OCT	14662	79.0	676	22425	27024
NOV	14745	78.0	630	18108	26757
DEC	14736	79.0	679	15731	26842
JAN	15125	77.0	475	17699	26627
FEB	15488	77.0	516	33605	26705
MEANS	13972	74.0	552	20674	27543

MONTH	V23L1	V11	V12	V25L2	
OCT	13686	9057	4705	21495	
NOV	14662	7883	4222	17191	
DEC	14745	7828	3700	13148	
JAN	14736	5931	3738	22689	
FEB	15125	2982	2434	25844	
MEANS	13932	6675	3129	21661	

V16 Data base mean 20696.3633
V16 predicted from data base means 20726.2007

17. V17--Percent Demands for RO Items

	PREDICTED	ACTUAL	%
OCT, FY 81	69.6	72.0	-3.3
NOV, FY 81	77.0	73.0	5.5
DEC, FY 81	76.7	76.0	.9
JAN, FY 81	77.9	69.0	12.9
FEB, FY 81	76.0	77.0	-1.3

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	75.4	73.4	2.7
STD. DEV. FIVE MONTHS	3.3	3.2	
MEANS FOR 1ST FOUR MONTHS	75.3	72.5	3.9
STD. DEV. 1ST FOUR MONTHS	3.8	2.9	

DATA USED IN PREDICTIONS

MONTH	V1	V2	V10L3	V27	V12L2
OCT	49.0	63.0	3384	79.0	1714
NOV	57.3	73.4	3276	78.0	4283
DEC	64.2	79.9	395	79.0	4705
JAN	52.0	68.9	2602	77.0	4222
FEB	66.1	80.6	4162	77.0	3700
MEANS	58.1	72.5	5683	74.4	3106

MONTH	V31L3				
OCT	1516				
NOV	453				
DEC	1762				
JAN	507				
FEB	428				
MEANS	661				

V17 Data base mean 73.9047
V17 predicted from data base means 73.9045

18. V18--Number of Backorders

	PREDICTED	ACTUAL	%
OCT, FY 81	13647	8859	54.0
NOV, FY 81	5562	8021	-30.7
DEC, FY 81	5060	7907	-36.0
JAN, FY 81	4697	8560	-45.1
FEB, FY 81	7198	7879	-8.6

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	7233	8245	-12.0
STD. DEV. FIVE MONTHS	3711	440	
MEANS FOR 1ST FOUR MONTHS	7242	8337	-13.0
STD. DEV. 1ST FOUR MONTHS	4285	450	

DATA USED IN PREDICTIONS

MONTH	V27L1	V15	V30L2	V2L1	V30
OCT	76.0	21852	28	65.7	1265
NOV	79.0	24331	2452	63.0	843
DEC	78.0	44305	1265	73.4	1200
JAN	79.0	23594	843	79.9	827
FEB	77.0	34676	1200	68.9	27
MEANS	73.9	28114	897	73.0	923

MONTH	V11L3	V22			
OCT	4496	4.8			
NOV	1933	5.2			
DEC	8992	4.8			
JAN	9057	5.1			
FEB	7833	5.2			
MEANS	7092	2.3			

V18 Data base 7383.14286
V18 predicted from data base means 6957.92878

19. V19--Number of NSN's with an RO Requirement

But Not On Order

	PREDICTED	ACTUAL	%
OCT, FY 81	7709	7996	-3.6
NOV, FY 81	10211	10121	.9
DEC, FY 81	11185	8183	36.7
JAN, FY 81	15137	10391	45.7
FEB, FY 81	13981	11932	17.2

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	11645	9725	+19.7
STD. DEV. FIVE MONTHS	2975	1646	
MEANS FOR 1ST FOUR MONTHS	11061	9173	+20.6
STD. DEV. 1ST FOUR MONTHS	3086	1258	

DATA USED IN PREDICTIONS

MONTH	V29L2	V30	V31	V5	V6
OCT	9716	1265	507	26757	7.1
NOV	9957	843	428	26842	8.3
DEC	5821	1200	1974	26627	7.4
JAN	5184	827	826	26705	8.3
FEB	7983	27	1042	26143	9.0
MEANS	5736.6	922.8	786.0	27673.3	5.85

V19 Data base mean 9989.0781
V19 predicted from data base means 8192.2467

20. V20--Dollar Value of NSN's with an RO

Requirement But Not On Order

	PREDICTED	ACTUAL	%
OCT, FY 81	1532	1006	52.3
NOV, FY 81	1887	2229	-15.3
DEC, FY 81	1450	1600	-9.4
JAN, FY 81	1372	2745	-50.0
FEB, FY 81	1872	3662	-48.9

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	1623	2248	-27.8
STD. DEV. FIVE MONTHS	241	1026	
MEANS FOR 1ST FOUR MONTHS	1560	1895	-17.7
STD. DEV. 1ST FOUR MONTHS	227	755	

DATA USED IN PREDICTIONS

MONTH	V19	V25L2	V30	V25L3	V26L3
OCT	7996	21727	1265	20309	59.0
NOV	10121	21495	843	21727	59.0
DEC	8183	17191	1200	21495	59.0
JAN	10391	13148	827	17191	59.6
FEB	11932	22689	17	13148	56.9
MEANS	9989	21346	923	21110	75.3

V20 Data base mean 1450.5225
V20 predicted from data base means 1450.5244

21. V21--Number of NSN's on Hand Over RO + ERQ

	PREDICTED	ACTUAL	%
OCT, FY 81	17529	17089	2.6
NOV, FY 81	19398	18615	4.2
DEC, FY 81	20142	18702	7.7
JAN, FY 81	20921	19615	6.7
FEB, FY 81	21639	20287	6.7

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	19926	18862	5.6
STD. DEV. FIVE MONTHS	1581	1207	
MEANS FOR 1ST FOUR MONTHS	19498	18505	5.4
STD. DEV. 1ST FOUR MONTHS	1452	1047	

DATA USED IN PREDICTIONS

MONTH	X26	X3	X4L1	X6	X30L2
OCT	59.6	31217	8.4	7.1	28
NOV	56.9	33139	10.6	8.3	2452
DEC	58.5	34643	11.4	7.4	1265
JAN	56.7	35489	10.7	8.3	843
FEB	55.4	36382	11.3	9.0	1200
MEANS	73.9	30129	6.4	5.9	897

MONTH	V31L2	V18L1			
OCT	453	7960			
NOV	1762	8859			
DEC	507	8021			
JAN	428	7907			
FEB	1974	8560			
MEANS	719	7224			

V21 Data base mean 12599.3125
V21 predicted from data base means 12603.5931

22. V22--Dollar Value of NSN's on Hand Over RO

+ ERQ

	PREDICTED	ACTUAL	%
OCT, FY 81	4.0	4.8	-15.7
NOV, FY 81	3.2	5.2	-38.5
DEC, FY 81	4.6	4.8	-4.2
JAN, FY 81	4.5	5.1	-11.8
FEB, FY 81	5.4	5.2	3.8

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	4.3	5.0	-14.0
STD. DEV. FIVE MONTHS	.8	.2	
MEANS FOR 1ST FOUR MONTHS	4.1	5.0	-18.0
STD. DEV. 1ST FOUR MONTHS	.6	.2	

DATA USED IN PREDICTIONS

MONTH	V21	V3	V4	V10	V30
OCT	17089	31217	10.6	5942	1265
NOV	18615	33139	11.4	6177	843
DEC	18702	34643	10.7	14736	1200
JAN	19615	35489	11.3	12241	827
FEB	20287	36382	11.5	18325	27
MEANS	12599	30129	6.5	5411	923

MONTH	V31	V9L1	V14L2	V3L1	
OCT	507	66.7	97	30694	
NOV	428	69.6	398	31217	
DEC	1947	70.4	363	33139	
JAN	826	76.2	327	34643	
FEB	1042	75.4	282	35489	
MEANS	786	81.3	115	30146	

V22 Data base mean 2.2333
V22 predicted from data base means 2.3305

23. V23--Number of NSN's with 30 Day Usage

	PREDICTED	ACTUAL	%
OCT, FY 81	12755	14662	-13.0
NOV, FY 81	13183	14745	-10.6
DEC, FY 81	13426	14736	-8.9
JAN, FY 81	13697	15125	-9.4
FEB, FY 81	13717	15488	-11.4

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	13356	14951	-10.7
STD. DEV. FIVE MONTHS	401	350	
MEANS FOR 1ST FOUR MONTHS	13265	14817	-10.5
STD. DEV. 1ST FOUR MONTHS	400	209	

DATA USED IN PREDICTIONS

MONTH	V23L1	V21	V22	V18L1	V2L2
OCT	13686	17089	4.8	7690	71.1
NOV	14662	18615	5.2	8859	65.7
DEC	14745	18702	4.8	8021	63.0
JAN	14736	19615	5.1	7907	73.4
FEB	15125	20287	5.2	8560	79.9
MEANS	13785	12599	2.2	7399	73.0

MONTH	V31L3	V5L3	V31L2	V31L1	
OCT	1516	27126	453	1762	
NOV	453	27078	1762	507	
DEC	1762	27024	507	428	
JAN	507	26757	428	1974	
FEB	428	26842	1974	826	
MEANS	661	27247	719	725	

V23 Data base mean 13971.8359
V23 predicted from data base means 13777.4830

24. V24--Dollar Value of NSN's with 30 Day Usage

	PREDICTED	ACTUAL	%
OCT, FY 81	2.0	1.8	11.1
NOV, FY 81	4.6	1.9	142.1
DEC, FY 81	4.6	1.6	187.5
JAN, FY 81	5.2	1.9	173.7
FEB, FY 81	2.8	2.0	40.0

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	3.4	1.8	88.9
STD. DEV. FIVE MONTHS	1.9	.2	
MEANS FOR 1ST FOUR MONTHS	4.1	1.8	127.8
STD. DEV. 1ST FOUR MONTHS	1.4	.1	

DATA USED IN PREDICTIONS

MONTH	V30L1	V31L1	V11L2	V14L2	V6L2
OCT	2452	1762	1933	97	6.5
NOV	1265	507	8992	398	6.5
DEC	843	428	9057	363	7.1
JAN	1200	1974	7883	327	8.3
FEB	827	826	7828	282	7.4
MEANS	856	725	7003	115	5.7

MONTH	V28L1	V16L2	V6L1	V18	
OCT	2221	22425	6.5	8859	
NOV	3334	18108	7.1	8021	
DEC	4942	15731	8.3	7907	
JAN	6446	17699	7.4	8560	
FEB	3841	33605	8.3	7879	
MEANS	4198	20674	5.8	7383	

V24 Data base mean 1.6429
V24 predicted from data base means 1.6429

25. V25--Warehouse Issue Confirms

	PREDICTED	ACTUAL	%
OCT, FY 81	24370	17191	41.8
NOV, FY 81	27060	13148	105.8
DEC, FY 81	23100	22689	1.8
JAN, FY 81	25859	25844	.1
FEB, FY 81	24300	24569	-1.1

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	24938	20688	20.5
STD. DEV. FIVE MONTHS	1538	5356	
MEANS FOR 1ST FOUR MONTHS	25097	19718	27.3
STD. DEV. 1ST FOUR MONTHS	1727	5654	

DATA USED IN PREDICTIONS

MONTH	V16L3	V18	V27	V13L1	V18L3
OCT	23723	8859	79.0	676	5229
NOV	22425	8021	78.0	630	9624
DEC	18108	7907	79.0	679	7960
JAN	15731	8560	77.0	475	8859
FEB	17699	7879	77.0	516	8021
MEANS	20598	7383	74.4	552	7277

MONTH	V5				
OCT	26757				
NOV	27842				
DEC	26627				
JAN	26705				
FEB	26143				
MEANS	27673				

V25 Data base mean 21690.8438
V25 predicted from data base means 21692.8423

26. V26--Percent Total NSN's on Hand Which Have An RO

	PREDICTED	ACTUAL	%
OCT, FY 81	60.2	59.6	1.0
NOV, FY 81	57.8	56.9	1.6
DEC, FY 81	59.3	58.5	1.4
JAN, FY 81	56.1	56.7	-1.1
FEB, FY 81	55.4	55.4	0

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	57.8	57.4	.7
STD. DEV. FIVE MONTHS	2.0	1.6	
MEANS FOR 1ST FOUR MONTHS	58.4	57.9	.9
STD. DEV. 1ST FOUR MONTHS	1.8	1.4	

DATA USED IN PREDICTIONS

MONTH	V21	V7	V8L1	V2L3	V5L2
OCT	17089	18616	6.4	79.5	27078
NOV	18615	18896	8.4	71.1	27024
DEC	18702	20291	8.9	65.7	26757
JAN	19615	20131	8.4	63.0	26842
FEB	20287	20151	8.7	73.4	26627
MEANS	12599	22219	4.7	72.8	27409

MONTH	V23				
OCT	14662				
NOV	14745				
DEC	14736				
JAN	15125				
FEB	15488				
MEANS	13972				

V26 Data base mean 73.9047
V26 predicted from data base means 73.9049

27. V27--Percent Total Dollar Value NSN's with An RO

	PREDICTED	ACTUAL	%
OCT, FY 81	78.1	79.0	-1.1
NOV, FY 81	73.5	78.0	-5.8
DEC, FY 81	77.0	79.0	-2.5
JAN, FY 81	70.3	77.0	-8.7
FEB, FY 81	65.8	77.0	-14.5

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	72.9	78.0	-6.5
STD. DEV. FIVE MONTHS	5.0	1.0	
MEANS FOR 1ST FOUR MONTHS	74.7	78.3	-4.6
STD. DEV. 1ST FOUR MONTHS	3.5	1.0	

DATA USED IN PREDICTIONS

MONTH	V20	V5	V2L2	V31L3	V3
OCT	1006	26757	71.1	1516	31217
NOV	2229	26842	65.7	453	33139
DEC	1600	26627	63.0	1762	34643
JAN	2745	26705	73.4	507	35489
FEB	3662	26143	79.9	428	36382
MEANS	1451	27673	73	661	30129

MONTH	V9L3				
OCT	74				
NOV	68.9				
DEC	66.7				
JAN	69.6				
FEB	70.4				
MEANS	82.6				

V27 Data base mean 74.3809
V27 predicted from data base means 74.7250

28. V28--Regular and Hot Item Backorders Released

	PREDICTED	ACTUAL	%
OCT, FY 81	3585	3334	7.5
NOV, FY 81	2247	4942	-54.5
DEC, FY 81	3975	6446	-38.3
JAN, FY 81	4540	3841	18.2
FEB, FY 81	3439	4452	-22.8

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	3557	4603	-22.7
STD. DEV. FIVE MONTHS	847	1196	
MEANS FOR 1ST FOUR MONTHS	3587	4641	-22.7
STD. DEV. 1ST FOUR MONTHS	975	1378	

DATA USED IN PREDICTIONS

MONTH	V2L1	V1L1	V31L1	V16	V18
OCT	65.7	50.0	1762	157431	8859
NOV	63.0	49.0	507	17699	8021
DEC	73.4	57.3	428	33605	7907
JAN	79.9	64.2	1974	16288	8560
FEB	68.9	52.0	826	26697	7879
MEANS	73.0	58.8	725	20696	7383

MONTH	V28L3	V1			
OCT	3221	49.0			
NOV	2929	57.3			
DEC	2221	64.2			
JAN	3334	52.0			
FEB	4942	66.1			
MEANS	4327	58.1			

V28 Data base mean 4091.6475
V28 predicted from data base means 4091.6190

29. V29--Regular and Hot Item Backorders Established

	PREDICTED	ACTUAL	%
OCT, FY 81	9994	5821	71.7
NOV, FY 81	6990	5184	34.8
DEC, FY 81	9189	7983	15.1
JAN, FY 81	6840	5481	24.8
FEB, FY 81	7746	5476	41.5

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	8152	5989	36.1
STD. DEV. FIVE MONTHS	1388	1137	
MEANS FOR 1ST FOUR MONTHS	8253	6117	34.9
STD. DEV. 1ST FOUR MONTHS	1581	1271	

DATA USED IN PREDICTIONS

MONTH	V26L1	V2	V16	V7L3	V13
OCT	59.0	63.0	15731	20027	630
NOV	59.6	73.4	17699	18644	679
DEC	56.9	79.9	33605	18017	475
JAN	58.5	68.9	16288	18616	516
FEB	56.7	80.6	26697	18896	408
MEANS	74.4	72.5	20695	22481	572

MONTH	V7L1	V2L1	V1L1	V29L2	V16L3
OCT	18017	65.7	50.0	9716	23723
NOV	18616	63.0	49.0	9957	22425
DEC	18896	73.4	57.3	5821	18108
JAN	20291	79.9	64.2	5184	15731
FEB	20131	68.9	52.0	7983	17699
MEANS	22378	73.0	58.8	5737	20598

V29 Data base mean 6165.3125
V29 predicted from data base means 6165.2972

30. V30--AOA Dollar Value

	PREDICTED	ACTUAL	%
OCT, FY 81	1706	1265	34.9
NOV, FY 81	901	843	6.9
DEC, FY 81	634	1200	-47.2
JAN, FY 81	809	827	-2.2
FEB, FY 81	-420	27	0

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	906	8324	8.9
STD. DEV. FIVE MONTHS	461	493	
MEANS FOR 1ST FOUR MONTHS	1013	1034	-2.0
STD. DEV. 1ST FOUR MONTHS	475	231	

DATA USED IN PREDICTIONS

	V12	V12L1	V2L3	V31L2	V30L1
OCT	4705	4283	79.5	453	2452
NOV	4222	4705	71.1	1762	1265
DEC	3700	4222	65.7	507	843
JAN	3738	3700	63.0	478	1200
FEB	2434	3738	73.4	1974	827
MEANS	3129	3070	72.8	718.9	856

MONTH	V11	V23	V24	V7L1	
OCT	9057	14662	1.8	18017	
NOV	7883	14745	1.9	18616	
DEC	7828	14736	1.6	18896	
JAN	5931	15125	1.9	20291	
FEB	2982	15488	2.0	20131	
MEANS	6675	13972	1.5	22377	

V30 Data base mean 922.7607
V30 predicted from data base means 696.6332

31. V31--A3A Dollar Value

	PREDICTED	ACTUAL	%
OCT, FY 81	675	507	33.1
NOV, FY 81	1034	428	141.6
DEC, FY 81	1245	1974	-36.9
JAN, FY 81	1240	826	50.1
FEB, FY 81	-1.6	1042	----

	Predicted	Actual	%
MEANS FOR FIVE MONTHS	838	955	-12.3
STD. DEV. FIVE MONTHS	524	621	
MEANS FOR 1ST FOUR MONTHS	1049	934	+12.3
STD. DEV. 1ST FOUR MONTHS	268	715	

DATA USED IN PREDICTIONS

MONTH	V7	V32	V2	V30	V7L3
OCT	18616	1	63.0	1265	20027
NOV	18896	2	73.4	843	18644
DEC	20291	3	79.9	1200	18017
JAN	20131	4	68.9	827	18616
FEB	20151	5	80.6	27	18896
MEANS	22219	7.1	72.5	923	22481

MONTH	V13L2	V30L3			
OCT	400	444			
NOV	676	28			
DEC	630	2452			
JAN	679	1265			
FEB	475	843			
MEANS	543	915			

V31 Data base means 785.5909
V31 predicted from data base means 858.9007

E. PERFORMANCE OF THE MODELS

As was shown in the preceding pages of this chapter, the performance of the models and their ability to predict varied considerably. A summary of their ability to predict is shown in tabular form in Table 4. From this table, it is shown which models were consistent predictors. In those cases where the models did not make accurate enough predictions to be of use, a greater data base would have been useful in eliminating the problem of the models being asked to operate outside of their proper ranges. Note that many of the models functioned quite well inspite of their independent variables being outside a plus-or-minus one standard deviation from their data base means. Note also that all the models,except those for V3, V19, V20, and V25, were asked to make predicitions with the values of the independent variables or the dependent variables being more than one standard deviation from the data base means.

Table 4

Predictive Performance of the Models

VARIABLE	FIVE MONTHS DATA PREDICTION ERROR	1ST 4 MONTHS DATA PREDICTION ERROR
V1	3.3%	4.2%
V2	8.8%	9.9%
V3	-.5%	-.2%
V4	10.8%	10.0%
V5	9.4%	10.0%
V6	12.5%	-9.0%
V7	-2.1%	-1.5%
V8	20.7%	16.5%
V9	15.6%	19.1%
V10	34.9%	43.0%
V11	33.4%	-19.1%
V12	.7%	-.5%
V13	26.9%	26.8%
V14	-48.6%	-36.6%
V15	-8.2%	-9.4%
V16	-41.7%	-30.6%
V17	2.7%	3.9%
V18	-12.0%	-13.0%
V19	19.7%	20.6%
V20	-27.8%	-17.7%
V21	5.6%	5.4%
V22	-14.0%	-18.0%
V23	-10.7%	-10.5%
V24	88.9%	127.8%
V25	20.5%	27.3%
V26	.7%	.9%
V27	-6.5%	-4.6%
V28	-22.7%	-22.7%
V29	36.1%	34.9%
V30	8.9%	-2.0%
V31	-12.3%	12.3%

As can be seen from Table 4, the models for the following 17 variables are especially useful in making predictions:

V1	V4	V7	V17	V23	V30
V2	V5	V12	V18	V26	V31
V3	V6	V15	21	V27	

The models for the following 6 variables should be considered useful but suspect:

V8	V9	V10	V19	V22	V25

The remaining 8 models for the following variables should be considered unreliable with extreme range data and should not be used unless it can be shown that they are being asked to predict within their joint ranges and are better predictors in the future than they are at the present:

V11 V13 V14 V16 V20 V28 V29

The fact that some of the models developed herein failed to measure up under real data tests does not mean that those variables they were to predict cannot be predicted, but that the data used in the data base did not support the making of accurate predictions. In other words, it just was not in the data. Future work in this area with a more extensive data base as future data becomes known and recorded for an effort such as this, would be expected to be productive. The limitations imposed by having only 24 sets of data, of which 3 sets were used to create lagged variables, left only 20 total degress of freedom. It is extremely easy under such circumstances of a less than voluminous data base to exceed the joint regions. Of the models in the "don't use" list, all were stressed by values obviously outside their ranges or by values close to the edge.

VI. USING THE MODELS

A. INTRODUCTION

This chapter is presented to give the user of the models a set of general procedures for their use. Because of the complexity of SASSY and the many jobs in the SASSY Management and the General Account, it is recognized that no one set of equations will provide the information needed by all, and certainly the set of thirty-one equations would be beyond the needs of many. For example, the equations that would benefit the General Account Warehouse Manageer are considerably different from are those that would benefit an accounting clerk in the SASSY Management Unit. The warehouse manager would like to have a handle on the receipts from due, the number of NSN's on hand, the number of NSN's on hand with an RO, etc. He really has little need for the more esoteric variables as dollar value of NSN's with an RO requirement but not on order. His basic need is to know how much he has to hold, in how many line items, and when and how much is coming in from dues. Because of the varying needs of the different users, it is not practical to attempt to cover all situations in this chapter. Instead,

it is appropriate to discuss, in more general terms, the pitfalls and traps that can catch one unaware in the use of regression equations for prediction.

B. USING LAGGED VARIABLES

The ability to use lagged variables is a tremendous advantage for the values of the lagged variables are already known and do not have to be estimated. Note that some of the equations require almost no current values, whereas other require a mixture or almost all current values. In developing the equations, a real effort was made to use lagged variables to the maximum extent. Whenever possible, a preference was given to lagged variables for inclusion in the regression equations, even when they were not quite as good a predictors as current value variables. With lagged variables,it is possible to make projections ahead of time which serve to increase various planning horizons. In the cases where the equations also call for a current, that is non-lagged variable, the user of the equations is forced to estimate or predict the current values either with one of the other regression equations or through some first hand knowledge as to what the value will probably be. In this manner, one could find himself using several equations to provide good input to the equation predicting the variable

of interest. With the more "normally distributed" variables, the user has the option of simulating the distribution with a normally distributed random number generator to get a feel for the probable range of the variable. A short cut to this method is to take the Table 1 distributions and means and enter high and low values of the current variable into the regression equation for the variable of interest. A less radical approach would be to take a low value that was one standard deviation below the mean of the current variable and a high value that was one standard deviation above the mean. In the absence of any information about the current status of the SASSY Management Unit and the General Account, this approach seems to have merit. It is especially attractive in those cases where the relative impact of the current variable on the dependent variable is small. This can be seen easily in the case of V7. Referring to the Chapter IV equation for V7, it is seen that the intercept has a relatively large impact on the dependent variable; it is more than eighteen times larger than the impact of V14, V24 or V1, which are the current (or straight) variables used in the equation. The dependent variable prediction error is not very sensitive to errors in prediction of V1, for instance. Note that the standard

error for V1 is 23.9 which gives a lot of room for prediction. Even an error of 10 percent in V1 would have a small impact of only 144 NSN's with an RO on hand which is relatively small when compared with the data base distribution characteristics of mean = 22219, std. dev. = 1941. By this process, the values of 58% + 4.7% and 58% -4.7% (53.3 and 62.7%) would be used to simulate the probable range of V1. This process would continue for V14 and V24, and the result is a low and a high prediction coming out of the regression equation for V7. It is emphasized that any time there is operational information to suggest a probable value for one of the required current variables, then that probable value should be used instead of the one developed through the above process.

For the user, the ideal situation would be to have an equation which has as its independent variables only lagged variables; but this is seldom the situation. In the case of V8, only V22 is unknown and has a relatively small impact on the value of the dependent variable. In the cases of V9 and v10, all the variables are lagged, thus current data are not required in order for the user to make a prediction.

C. USING STRAIGHT VARIABLES

Only one of the 31 models operates strictly on straight variables. The others use only lagged variables or a combination of straight and lagged variables. The goal of being able to predict the next month's values without resorting exclusively to current data from that month has been met in most cases. It should be noted that in the one case of V14, the coefficient of determination was significantly lower than for the other regression equations. It also had a coefficient of variation in excess of .5 and was highly skewed and kurtotic. In other words, V14 is minimally predictable. This is not an unexpected finding for one would not expect to be able to predict the value of stock on order in excess of the economic retention quantity amount. This is the value of stock which should never have been ordered, and it is unlikely that such discrepancies should ever occur in a predictable fashion.

D. RELATIVE ERRORS

The greater the impact (the greater the standardized coefficient) an independent predictor variable has on the predicted dependent variable, the more care is required in estimating its value. When the standardized coefficient is relatively low, even a poorly estimated value for an

independent variable may work reasonably well. In equations with few straight variables and numerous lagged variables, much of the error introduced through an incorrect estimate of the straight variable will be offset by having concrete historical data for the lagged variables. The user should not be overly concerned with small errors in estimating the straight predictor variables, but should make a special effort for accuracy when the straight variable in question appears to have a large impact on the dependent variable as evidenced by the standardized regression coefficient.

E. MAKING DO WITH THE "BEST AVAILABLE INFORMATION"

The new user of regression equations tends to become overly sensitive to not having the data he really would like to have in order to make an informed prediction. It is worth emphasizing that there is no better information than the "best available" and that the user should not hold off making a prediction just because he lacks the data he would like. In such cases, it is recommended that the user attempt to simulate the range with a low and high value one standard deviation from the mean. Very frequently, this simulation will not be required for the user will be making his predictions half way through the month and will have a feel for the tempo and character of operations. Even if the

prediction is twenty or thirty percent off the actual value, it will have been of significant value; the variability and apparent randomness of the SASSY relationships previously prevented even coming close to such a prediction.

It has been emphasized repeatedly that the models require input that is within the range of the joint region of all the variables in a given equation, but until now, this keeping the model within range has not been discussed with the perspective of using the best available information. Note from the comments concerning the tests of the models in Chapter V. In more cases than not, one or more of the dependent variables was out of range, or the actual value of the dependent variable was out of the range of the two years of data that went into building the model. Some of the models are more robust than others and continue to provide accurate predictions, but as was also shown, some of the predictions that result from stressing a given model beyond its joint region are not reliable at all. A general guideline is to recognize, when using extreme "best available information", that the answers should be checked against the answers called for in one's own judgement and knowledge of the situation. For example, a negative value predicted for V30 or V31 would not mean that the SASSY

Management Unit had given up or returned funds to the OPBUD holder, but that very little funds were being received from the OPBUD holder. This was the case in the prediction of -420 (in thousands) for V30 for February, 1981. The actual value was only 27 (in thousands) which was very close to zero in comparison to the data base mean of 922 (in thousands).

F. HIERARCHY OF EQUATIONS FOR PREDICTION

The initial objectives stated in Chapter II were to identify and quantify SASSY relationships faced by the SASSY Management Unit. This has been done with the set of thirty-one regression models. A major spin-off use of these equations lies in their predictive power. In the case where one wishes to predict the next month's values for the equationsw, all that is required is to start by estimating the values of the non-lagged variables in equations that are relatively insensitive to errors in estimation.

The technique used is that of letting the lagged variables do most of the work. Specifically, estimates are made first for those variables which have as their combine total, the smallest percentage of the sum of the standard coefficients for the equations given in Chapter III. It was

in this manner that the following hierarchy in Table 5 was developed.

Table 5

Hierarchy of Equations for Prediction

Variable	% Total Std Coeff	Variable	% Total Std Coeff
V9	0	V21	15
V10	0	V1	15
V24	3	V12	16
V16	4	V25	17
V7	5	V30	18
V18	5	V13	21
V14	6	V2	21
V27	6	V29	22
V17	8	V4	25
V31	8	V11	35
V19	9	V5	36
V8	11	V15	54
V28	11	V20	57
V6	11	V3	68
V23	14	V22	68
V26	14		

As can be seen from Table 5, the impact of error in estimating the independent variables is relatively minor for variables at the beginning of the hierarchy and relatively great at the end of the hierarchy. For instance, for V18 which is predicted by V27L1, V15/V30L2, V2L1/V30, V11L3 and V22, the combined impact of a one standard deviation variance in V15/V30L2, V2L1/V30 and V22 is only 5% of the impact of a one standard deviation variance in all the predictor variables for V18. The advantage here lies in V27L1 and V11L3 being lagged variables and thus known quantities. Contrast this example using V18 with the V4 equation where only one independent predictor variable is

unknown and has to be estimated. A one standard deviation variance amounts to 25% of the total impact of all the independent variables varied by a one standard deviation amount. Thus, it is obvious that if the values of the non-lagged variables are not known, they should be estimated first in the equation for V18. Note that V18 is a predictor variable in the equations for V24, V25 and V28.

G. AUDITING

One of the OIC of the SASSY Management Unit's major problems is in knowing whether to believe his audits, his wall-to-wall inventories and other determination of stock held procedures. The same problem is true for the Comptroller, who is yet further removed from the scene of operations. The models contained herein provide a handy and quick way to audit the reports of stock held. When the reports are out of line with the projections that have been validated month after month, it is clear that there in a need for further investigation. One example might be the dollar value of all stock on hand. It only takes three variables, V22, V33 (a counting variable for the number of the period) and V18L2 for the Comptroller to obtain a feel for whether he should believe the reports of the value of stock held. The model for V4 can give the stock value

consistently within 10%, which in many supply systems is very close to the tolerance level for wall-to-wall annual inventories. Another audit example, this time for the OIC of the SASSY Management Unit: When the OIC asks for the dollar value of stock on order (V12) he does not have to rely only on the report he gets, but with only 7 variables, determine himself what the cost of stock on order is within 1%. The audit possibilities are almost limitless. With these models, the OIC of the SASSY Management Unit, has a very easy tool to use for checking the accuracy of his own reporting. The Comptroller providing funds to the SMU and wanting to know the cost of what is on hand, the cost of dues, the percent demands for RO items, etc., also has the ability to generate predictions based on historical data.

H. SUMMARY

The values of the variables introduced to the regression equations determine the value of the predicted variable. Judicial care must be exercised in selecting or simulating the values. Sophisticated simulation programs are available to help the user estimate the values of independent variables, though it is expected that such accuracy with the extra attendant effort would not be considered worthwhile. The actual use of the equations is fairly simple and is very

easily made more convenient with a small programmable hand calculator such as the Texas Instruments TI-59. For technology transfer purposes, Appendix C TI-59 Programs, has been included so that the user only need enter the dependent variable values in the lettered registers and push R/S to obtain a prediction. No representation is made that the TI-59 programs are optimized for efficiency; rather they were designed strictly for ease of use by persons who have had little or no programming experience. A short set of instructions in the actual use of the TI-59 programs is given at the beginning of Appendix C. Once the programs have been keyed into the calculator the procedures for the use of the programs are simple enough not to require special training to become proficient in making the predictions.

VII. TECHNOLOGY TRANSFER

A. INTRODUCTION

The value of the regressions developed in this thesis and the various systems relationships being quantified lies in their use. but to transfer such an abstract technology to operational use at the SASSY Management unit at Camp Pendleton and possibly to other SASSY Management Units throughout the Marine Corps is a greater task than developing a new methodology and a set of validated equations. Technology transfer, or information diffusion as it is sometimes called, is the introduction of new equipments, policies, procedures or information flows to a system which can use them. There has to be a perceived need for the transfer to be successful. It is imperative that at least those in the organizational infrastructure support the new technology or they will tend to "drag their feet and drop an anchor" or otherwise subvert the transfer effort in an attempt to prevent change. The thesis writer has no military authority in the commands to which the transfer is to be made; thus, for the transfer to be successful, the new technology must be championed from within the infrastructure

at the SASSY Management Unit or by those who do have the authority and power to cause the transfer to take place.

B. TRANSFER PLAN

The author approached the technology transfer problem simultaneously from the perspectives of the infrastructure and the formal military organization.

1. Commanding Officer, 1st Force Service Support Group

Colonel D. E. Benstead, the military commander with direct responsibility for the performance of the SASSY Management Unit, was approached early in the process, as was his Chief of Staff, Colonel G. H. Taylor. The 1st Force Service Support Group and its SASSY Management Unit were chosen over the others because of Colonel Benstead's background and the background of his officers in the SASSY Management Unit. He has a reputation for innovation and is known for his developmental work on major information systems introduced Marine Corps-wide. Specifically, he is considered the "father" of MIMMS, the principle maintenance management system which interfaces with both SASSY and MAGFARS. Colonel Benstead's blessing would not only open up and provide easy access to command files and records, but would also greatly enhance the actual transfer and the acceptance with which the new technology would be met.

Transfer of any new technology rests at one time or another squarely on the credibility of its proponents. Colonel Benstead was thus approached not only for his position of authority and power but also because of his credibility both within his own command, and throughout the Marine Corps, as a knowledgable logistician and Supply Officer with extensive systems experience. Any endorsement of this thesis effort and resulting equations by Colonel Benstead would not only add tremendous credibility but an aura of their having come from a "proper" source, i. e., from someone with a Supply background. The beauty of selecting Colonel Benstead as the first contact lay in the fact that combined in one person was authority/power, responsibility for the SASSY Management Unit, and a technical background, all of which would obviate the requirement to undertake a special education effort to bring the principle players in the command up to a level of understanding where they could comfortably embrace a set of "disembodied equations." It helped also that 1st Force Service Support Group, as a command, had a long history of supporting research and thesis efforts from such places as the Naval War College. In summary, 1st Force Service Support Group seemed like an excellent place at which to start.

2. Officer-in-charge, SASSY Management Unit

Major J. Wilson was the OIC of the SASSY Management Unit at the beginning of the thesis effort, but was soon succeeded by Major C. Moore. Both of these OIC's had spent considerable time as guest lecturers to the Practical Comptrollership Course given at the Naval Postgraduate School and had both the academic and work backgrounds to be able to immediately grasp the potential of a set of systems relationship equations applied to the SASSY Management Unit. The skepticism encountered revolved around the question of whether it was possible to develop a set of models and to validate the equations. The extreme variability of the data sets for each SASSY variable was nowhere better known than in the SASSY Management Unit. It bears repeating that technology transfer attempts are likely to be futile without developing the interest of qualified and influential parties within the system who can promote and guide its course. Because of his own engineering background and general familiarity with computer assisted statistical analysis, Maj. Moore spend a great deal of time explaining SASSY and the relationships he felt could be quantified. This developing of a "contact" within the system paid tremendous dividends in the narrowing down process of selecting

predictor variables, and in obtaining SASSY data. Maj. Moore's interest served also to spark the interest of several of his officers at the SASSY Management Unit, who will be there for some time after he is gone. The environment looked favorable for the transfer.

3. Comptroller, Fleet Marine Force, Pacific

Colonel Johnson, the Comptroller for two thirds of the operating forces of the Marine Corps, was approached repeatedly during a two week period while he was instructing at the Practical Comptrollership Course held at the Naval Postgraduate School. He was interested in the potential of the preliminary regression equations and wanted to know what confidence level he should be able to place in their predictions. It was during these conversations that it became known to the thesis writer that the "budgeteers" at Headquarters, Fleet Marine Force, Pacific, would like to know how to predict such SASSY variables as the RO Fill Rates.** The budgeting process at Headquarters FMFPac is a major evolution and has over the years become a fairly sophisticated process leaning heavily on special models, the most significant of which is the Resource Allocation Model

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** FMFPac includes a total of three of the four SASSY Management Units in the regular forces of the Marine Corps.

(RAM). The RAM is used for front end budget preparation prior the authorization or appropriation of funds by Congress.[45] The criteria for funding FMFPac commands are imbedded in the RAM with respect to the formal budget cycle. It is not uncommon, however, for significant sums of monies to become available near the year end. The logic and reasoning which served to allocate resources at the beginning of the budget process has been overtaken by events and history by the end of the fiscal year. It is at the end of the fiscal year that Colonel Johnson uses the RO Fill Rates of the FMFPac SASSY Management Units to determine which commands receive the bulk of the available year end funding. The general process at present is to weight the funding in the direction of the SASSY Management Unit with the lowest RO Fill Rate.[46] The emphasis on RO Fill Rate as a performance measurement criterion can be seen in the Headquarters, Marine Corps goal of 75% fill for all RO requisitions.

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[45] The Budget Control and Impoundment Act of 1974 requires that authorization bills precede appropriation bills.

[46] The RA = PE equation is disturbed by the year end funding of the SASSY Management Unit with the lowest RO Fill Rates if an equivalent amount of RA monies is not made available to the commands supported by that SASSY Management Unit. See Appendix B for further discussion of the corrective actions currently being taken to make a sick SASSY Management Unit well.

Colonel Johnson is thus shown to be in an extremely influential position and his endorsement of the SASSY Spending Model could cause it to be tried throughout FMFPac. By design, Colonel Johnson has been kept informed as to the progress of this thesis and on 1 April 1981 stated telephonically that he wanted to try the equations developed in Chapter III out on the SASSY Management Unit at 3rd Force Service Support Group, Okinawa, Japan to see if the same relationships hold that held at the SASSY Management Unit with 1st Force Service Support Group, Camp Pendleton, California.

C. SUMMARY

The transfer problem, even that of determining the variables for regression and obtaining the data in a useful and convenient format, was greatly aided by having previously served on the General Staff at 1st Force Service Support Group. Had this not been the case, the transfer plan would have been nearly the same except that a much greater effort would have had to have been made in entering the command. Letters of introduction and requests for support would have been required instead of personal acquaintance. In either case, copies of this thesis were planned to have been made available to the commands

concerned. Without having researched the principals at the other Force Service Support Groups, it is not possible to predict the level of interest that could have been generated had other than the 1st Force Service Support Group been chosen as the transfer site.

The key to successful transfer remains in having a product to sell that is credible and which meets a perceived need. If the organization which can benefit from the technology transfer is in fact a viable organization responding to changes in its environment, it tends to already have its feelers out for new ideas with potential. In predicting the use of the equations developed, it is fairly conservative to say that they will be used internally at the SASSY Management Unit at 1st Force Service Support Group for at least a while, but it is unknown whether the technology will "take" in the long run, or whether it will ever be applied to the other SASSY Management Units. Even if the equations developed for the SASSY Management Unit at 1st Force Service Support Group do not hold for the other SASSY Management Units, a methodology and a useful variables list have been developed which would make future such efforts that much easier for the other SASSY Management Units. It is not anticipated that the relationsips at the

other SASSY Management Units are radically different, thus the same predictor variables might be able to be used. Of course, the equation coefficients would be expected to differ because of the unique operating characteristics of each SASSY Management Unit. The methodology has been outlined very specifically in this thesis in order than the transfer might be easier, and so that it might provide a sound basis for follow-on work with the other SASSY Management Units. Appendix C is a set of user instructions written for the Texas Instrument TI-59 Programmable Calculator. The TI-59 was chosen because it is readily available at minimal cost and accepts a magnetic card input, thus putting the technology encompassed in the SASSY Management Unit Models within the capabilities of clerical personnel at the SASSY Management Unit. The transfer problem was been reduced in this to three components, each of which has been met:

•Develop or identify a need so that it can be recognized by the organization to which the technology would be transfered.

•Develop supporters of the new technology both within the infrastructure and the official command structure of the organization.

•Make the new technology as simple and convenient to use as is possible. Ideally, the new technology would not require any special training on the part of those who would be using it. With these three main points satisfied and considered at each step in the development of this thesis, the probability of the SASSY Management Unit at Camp Pendleton being able to adopt the new procedures is greatly increased.

VIII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

This thesis writer set out to develop a methodology for quantifying SASSY variables and presenting the relationships in such a fashion as to be useful to the OIC of the SASSY Management Unit, and which could be used for predictive purposes by both the SASSY Management Unit personnel and those who do the budgeting. To this end, the relationship between SASSY, MAGFARS and MIMMS was researched along with background information on Class I data processing systems, supply policy and budget procedures. A research design was developed which guided the thesis effort throughout and which led directly into the construction of thirty-one regression models. These models were then tested against actual data from the SASSY Management Unit at Camp Pendleton, California, for the first five months of Fiscal Year 1981. The test results were separated into three categories:

- Useful in making predictions.
- Useful but suspect.
- Do not use unless....

Much of the discussion about testing the models was pertinent to their use and led into a more detailed set of cautions for the user. The best of work loses significance if it cannot be used to advantage. As detailed, the eventual transfer of a set of "disembodied equations" to Marine Corps use was a constant consideration.

B. CONCLUSIONS

It would be gratifying to conclude that all the equations are accurate predictors which show causality; however, that is not the case. The majority of the equations developed do, in fact, make accurate enough predictions for general use, but there are those which leave much to be desired in the way of accuracy. The data base from which the equations were developed was limited in its ability to have a joint region which covered all the cases encountered in the FY 81 data. It has been shown that it is possible to over-stress the models at the fringes and beyond the limits of the joint regions. In future years, when more data is available to increase the data base from its meager twenty-four months of data sets, it should be possible to further refine the models so that they are more accurate, especially those which are presently in the "do not use unless...." category.

In summary, it is concluded that quantifiable relationships between various important SASSY variables, as viewed from the perspective of the OIC of the SASSY Management Unit do exist. The thesis hypothesis has been tested and was not rejected.

C. RECOMMENDATIONS

Because of the success of this thesis effort in developing usable equations that support the thesis hypothesis, it is recommended that:

- The regression models developed herein be used at the SASSY Management Unit, 1st Force Service Support Group, Camp Pendleton, California.
- The regression equations be tested for use at the SASSY Management Units with 2nd Force Service Support Group and 3rd Force Service Support Group.
- That magnetic card programmable calculators be considered for use in making predictions with the regression equations.
- That a project similar to this thesis be undertaken to quantify the relationships facing the SASSY Management Units with 2nd and 3rd Force Service Support Groups.

APPENDIX A: SELECTED LITERATURE

A. GENERAL

The excerpts from letters, working papers, messages, etc., presented in this appendix served to guide the initial research into the problems facing the Officer-in-Charge of the SASSY Management Unit. The major subject areas addressed are those dealing with not knowing the system relationships and not being able to make predictions. They have been included for the purpose of detailing how widespread is the concern for economical and efficient operation of the SASSY Management Unit. The topics in the literature generally fell into five main categories:

- RA = PE effect on SASSY Management Unit overhead
- Performance criteria
- Buying policy/stratified cost criteria
- Demand prediction
- Excesses/Deficiencies

As can be seen by the various commands' comments, there is no general agreement with respect to solutions to the

problems, or even to the causes of the problems. The command or person authoring each document is identified in order that the reader might better relate to the perspectives of the various levels of command. Before reading these exerpts, it will be helpful to the reader to review Figure 1, Chapter III, "Budget and Supply Relationships".

B. RA = PE EFFECT ON SMU OVERHEAD

1. 3rd FSSG Talking Paper of 8 Mar 1977

Subject: OFFS Deficiencies

Background: Under current accounting procedures, situations can arise which can result in a reduction in PE without a corresponding reduction in RA, and a reduction in RA without a corresponding reduction in PE.

Discussion:

1. In some instances, a unit may take action that is completely proper and in accordance with current orders and directives and still cause a reduction in the General Account PE funds without a corresponding reduction in the unit RA. Examples of such things are processing lost shipments from outside sources to units with a value less than $100 and receipt of material by the unit after a valid cancellation attempt has been made.

2. Other actions which may cause a PE reduction without a corresponding RA change are in direct violation of existing orders; however, due to the volume of transactions, they are extremely difficult to detect. Even if detected, it is impossible to differentiate between an honest mistake and a knowing attempt to acquire material without charge. They include such things as:

a. Inventory loss when material has actually been consumed.

b. Failure to properly process receipts followed by cancellation of the backorder.

c. Issue to assembly instead of proper backorder release.

d. Purpose Code transfers with a No Cost JON not the result of a redistribution within the major command.

e. Processing a transaction to roll material to the General Account but not actually returning the material.

These problems have been reported in the past without satisfactory results. Solutions recommended such as "increased command interest" and "Using Unit Accounting Section of the SMU should challenge cancellation requests" are not solutions in the real world. The service unit cannot become the policeman for the actions taking place within the supported units as the identification of many of the transactions would require on site physical inspection of the supply account.

3. There are other situations which can result in the reverse situation whereby the RA held by the units is reduced without a corresponding reduction in PE. These are situations where material held by the General Account is sold to a customer without a requirement for replenishment being generated. They include:

a. Filling a requisition with material on hand in excess of the General Account requisitioning objective.

b. Utilizing rollback material to satisfy General Account deficiencies.

c. Placing Initial Issue Provisioning (IIP) projects which are received free of charge from the ICP in stock and subsequently selling these items to end use. These actions are to some degree offsetting to those actions described in paragraphs 1 and 2 above. Without this offest the General Account would be unable to function as the gap between RA and PE widened through the fiscal year. It is imperative that the financial accounting system be able to insure that each unit receives exactly its fair share of available assets and no more or less.

<u>Recommendations</u>: That the accounting system be revised so that a unit is charged for all material consumed no matter what the method of consumption and that the unit not be charged for those items which have been previously paid for or acquired through other sources such as IIP.

2. Assistant Chief of Staff, Comptroller,

3rd FSSG, ltr 51/AGB/twa 7000 of 28 Nov 1977

to Force Service Support Section, HQ, 3rd FSSG

Subj: Point Paper on Fiscal Related Items for Discussion at Headquarters, Marine Corps

I. Topic: SMU Operating Overhead

Discussion: Funding of the SMU is on a 1:1 RA to PE funding ratio, operating expenses are not considered when customers make a buy from the SMU. The following narratives, by functional area, reflect the deficiencies and situations the current system of funding creates.

A. RO Deficiencies. Items identified for replenishment of operating stocks for the General Account at the commencement of a fiscal year.

B. RO recomputation:

1. The item review process is a SASSY subsystem that recomputes the requisitioning objective (RO) per line item. The item review subsystem recomputes the requisitioning objective based upon the usage data of the prime NSN family. When these RO recomputations identify new RO items or an increase in the existing requisitioning objective, procurement dollars must be available to meet the additional stockage requirements. The item reveiw subsystem is run monthly.

2. Since the implementation of SASSY there has been a steady increase of RO items/quantities. This is caused by the more concise, comprehensive and accurate collection of usage data and utilization thereof in computing valid RO's at the General Account level and using units. This increase will continue as long as new items are introduced to the supply system. Failure to fund this overhead expense will result in increased RO deficiency, increased backorders and drop the RO fill rate.

3. The maintenance float account and the medical section with the FSSG Logistic Support Units have been a contributing factor in the recomputed stockage requirements due to the free issues the General Account was required to transact for deployed unit inventories. Issues for inventory explansion, or the creation of new T/E requirements or the deployment of Logistic Support Units draw down the on-hand stock. The inventory issues force automatic buys through SASSY. The automatic buy usage data justify the creation and/or expansion of the current requisitioning objective. Thus a vicious cycle is in existence to provide supply support that's commensurate to the customers' needs; however, the General Account cannot keep pace with SASSY unless funding is made commensurate with the computed stockage requirements ....

5. Obsolete items generate excess stocks which drain the stockage availability in a direct relation and the creation of no RO items without sales and financially drain the account. ....

3. Commanding General, FMFPac ltr 12/RL/dmd 7000

of 15 Feb 1978

Subj: Policy Change for the Management of Requisitional Authority (RA) in FMFPac

1. Purpose. To establish policy for allocating requisitional authority to Fleet Marine Force, Pacific.

2. Background. We have been allocating Requisitional authority (RA) on the premise that a balance between RA and planning estimate (PE) (procurement) funds had to be maintained each fiscal year. Thus, when mide-year or year-end PE procurement funds were allocated, we matched these funds with requisitional authority. The result was that commands rushed to obligate the additional RA before year-end which created a last minute sugre of demand against the SASSY Management Unit (SMU). Moreover, because units were pressed to obligate RA quickly, the items requisitioned were often not those most needed by those easiest to requisition. Demand not only went up, but the items demanded were different from those ordered in the first eleven months of the fiscal year. These surges in demand and changes in the demand patterns complicate the SMU managers' inventory management problem.

4. Discussion. The requirement to match RA and PE procurement in each year is self-imposed and not a requirement of higher authority. Therefore, we intend to balance RA and PE procurement over the long run instead of within each fiscal year. For example, PE procurement funds may be issued at mid-year or year-end without matching RA. FSSG commanders can use these funds to build inventories against which RA can be issued next year. Conversely, RA may be advanced to commands as required temporarily drawing inventories down. year-end surges of demand can thus be avoided and SMU managers should be better able to plan their inventories. Close liaison between this Headquarters and FSSG commanders will be required for effective implementation of this policy...........

4. 1st FSSG Position Paper, undated

AGENDA ITEM. Funding for the General Account

PREPARING COMMAND. 1st FSSG

BACKGROUND. There has been continuing dialogue regarding the proper funding levels to be allocated to the General Account. The perception of financial managers is that an inordinate share of financial resources is applied to the SMU without a commensurate material return. This view has often been debated within the financial community. Nonetheless, there has yet to be developed an alternative short term solution in the Force which could at least be described as a *modus vivendi* pending final resolution by M3S. In the recent past there have been programmed attempts to alter stock levels through changes in Force funding allocations. Such techniques as issuing more OFFS than OPBUD procurement at one point in the fiscal year and more OPBUD than OFFS at year end have been employed. In addition, advances of OPBUD procurement have been issued from fourth quarter funds during the first half of the fiscal year. At present, a greater amount of requisitional authority than OPBUD procurement is available within I MAF. The net result of these policies has been to create a material debt within the General Account. This material debt is reflected not only in the performance criteria established by CMC, but also in the reduced ability of the SMU to sustain timely support for both Class IX (repair parts) and SAC 1 T/E deficiency purchases........it is necessary to return to the policy of matching OPBUD procurement funding to the cummulative total of OFFS authorizations allocated to I MAF. If such a policy is reinstituted, the positive results of funding the deficit above can be maintained, given the neutralization of the continuing drain created by overhead requirements. ......

RECOMMENDATIONS. That a one time allocation of OPBUD procurement not be matched by OFFS in the amount of $1.143 million be provided to the SMU, 1st FSSG prior to FY79 year-end; and that the OPBUD procurement account be maintained at a level 5% above the cummulative total of OFFS resident in I MAF during FY80 and thereafter.

5. 1st FSSG Point Paper of 30 Sep 1977

Topic: Funding Shortfall inthe SASSY Management Unit (SMU)

Background. Historically Planning Estimate (PE) funds for SMU procurements have been provided on a one for one basis with Requisitional Authority (RA) issued to

customers. This action, in effect, constrains the SMU to procurement of stocks only as they are drawn down.

Illustrative of the dynamic growth in the volume of business experienced by the SMU is the fact that in October 1976, the SMU had calculated authorized stock levels for 9,900 items, by September 1977 this had grown to 16,500 items worth $3.7 million, and an increase in the number of demands received on a monthly basis, i.e., 19,700 in January worth $778,000 to 32,000 in August worth $952,000.

In order to fund the 60 day operating level, 30 day safety level and 30 day order/ship time and place the items newly authorized for stockage on the shelf, the SMU was required to spend at a rate greater than "sales to customers". Consequently, by mid-August, a shortfall, estimated at $700,000, was reported to FMFPac.

Discussion. As a result of the projected shortfall, the SMU, 1st FSSG instituted some exceptional management procedures to constrain resupply requisitions and conserve dollars. Additionally, any response from an Integrated Material Manager requesting return of reported excess for potential credit was expedited.

As a result of the exceptional management actions instituted, the computer recommended "buy" has increased from $632,000 in mid-August to $926,500 as of 23 September. This represents the dollar value of stocks not able to be procured. As a consequence, the ability of the SMU to fill customer demands will be degraded about mid-October as shelf stocks and receipts from procurement in early August are consumed. The potential result is a degradation of readiness in I MAF units, due to deadlined equipment and an increase in NORS requisitions. The expedited action to return excess assets for credit has only resulted in $40,769 worth of credits to date.

Recommendation. That CG, FMFPac increase the first quarter FY78 Planning Estimate Authorization for 1st FSSG by 40% over that provided in the same Quarter of FY77 assuming that the funding level will be the same to allow for procurement of accumulated backlog.

6. Headquarters, FMFPac Point Paper 12B/rgb of 4 Sep 1979

1. SUBJECT: Funding of the General Account

2. BACKGROUND: Continuing interest exists throughout the Marine Corps in the proper method for funding the General Accounts. Present financial resources cannot

accomodate the funding requirements of General Accounts using current investment criteria. Inherent to the funding policy is the method used to predict demands and, ultimately, inventory levels. As a practical matter, we must first solve the issue of stockage policy before addressing the funding policy.

3. DISCUSSION: It is generally accepted that it is the requirement of the General Account to provide uninterrupted supply support. However, it is further generally accepted that there is a level of acceptable risk of stocking out of any given item at a given time. Therefore, there will always be a requirement to fund for and pass requisitions. HQMC has established goals for the General Account for stock availability. Obviously good management exists if a General Account can equal or exceed this goal and still provide funding for passed requisitions. However, neither objective should be sacrificed at the other's detriment.

The Force Comptroller has issued Requisitional Authority (RA) to WestPac units without supporting Planning Estimate (PE) Procurement dollars to the General Account. (FMFPac msg 0500319Z April 79 to all FMFPac major commands applies). This in fact did cause a drawdown of inventory at the General Account. This was done after an analysis of the General Accounts inventory and verbal liaison with the General Accounts.

4. Specific Points to Be Made

a. The objective of issuing RA not backed by PE (Procurement) is to adjust, through financial controls, the size of excess stocks in the SMU General Account; the objective is not to reduce the deficiencies of supported units.

b. Thus, RA issued without supporting PE should be limited to requisitions for "fill or kill" supply action.

c. In order to meet financial obligation goals dictated by CMC, it is advantageous to issue RA without supporting PE to the General Account because of the timing required to obligate requisitions by using units.

d. Review of stockage policy and funding policy should be undertaken jointly.

7. 1st FSSG Point Paper 40/JAW/tmg 4400 of Oct 1978

.....Theoretically, a one-for-one PE to RA relationship should exist. If the SMU had on hand usable/salable excesses, a relationship of RA greater than PE could

theoretically exist. It has been historicaly proven; however, that SMU excesses are not salable and that an RA greater than PE system does not actually work. In fact, the reality of the situation is that PE should be greater than RA because of numerous reasons deliniate subsequently. SMU overhead is a means to accomodate a PE greater than RA relationship. In other words, PE should be greater than RA in amount equal to SMU overhead. Precedence for this is firmly established within existing DoD, DLA, GSA and Marine Corps pricing policy. The SMU sources of supply all mark up these prices to allow for recoverable losses. Without SMU overhead; however, the SMU is not afforded a similar advantage. Accordingly, SMU overhead is necessary for sound supply/fiscal management.

C. PERFORMANCE GOALS

1. CG FMFPac spdltr LMP/gjw 4400 of 6 Jan 1977

Enclosure (1)

SASSY GENERAL ACCOUNT PERFORMANCE GOALS

MEASUREMENT AREA	CMC GOALS
Number of Monthly Updates	Min. of 12
% Complete Fill for RO Items	75%
Warehouse Denial Rate	3%
Receipt Processing Time	80% w/in 5 das
Excess Dues Over ERQ	Not over 10% $ of Dues
Inventory Adjustments	Not over 10% of Total$

2. Comptroller, Hq, FMFPac Point Paper 12C of 16 Aug 1979

....

c. The present method reduces the requirement for investment in high cost items by stratifying RO items according to unit price. This tends to improve RO fill

rate, the accepted measure of performance. However, there has been a concomitant increase in funding requirements for the General Account.

d. The RO fill rate, as a measure of performance, does not consider all demands made upon the General Account; it considers only those demands made for RO items. In this regard, the RO fill rate is only a partial indicator of General Account performance. A better measure of performance is the fill rate for all demands made on the General Account, not just demands made for RO items........

f. Reduced inventory investment and improved overall fill rate are not mutually exclusive conditions. The key is accurate prediction of demand.....

D. BUYING MODEL/STRATIFIED COST CRITERIA

1. 1st FSSG Point Paper of 4 April 1979

TOPIC: SASSY Management Unit (SMU) General Account responsiveness to I MAF logistic readiness requirements.

BACKGROUND: The General Account of the SMU is the primary source of supply for I MAF forces except for aviation peculiar items. The General Account's stockage of line items in anticipation of actual requirements directly relates to the force's logistics readiness posture. The stockage policy for the general account is established by CMC and is an integral part of a Class I computerized system. This stockage policy is predicated upon historical usage data and it is primarily from this data that the replenishment of General Account stocks is accomplished. This stock replenishment is funded by Planning Estimate (PE) procurement dollars. The General Account's responsiveness to logistics readiness requirements; therefore, is related to the PE funding provided to routinely requisition stocked and non-stocked items as required. The items qualifying for stockage are termed requisitioning objectve (RO) items. The CMC-directed stockage rules which determine which RO items will be stocked are as follows:

Standard Unit Price	Freq of Demand in One Year	Min Stock Qty/ Reorder Point
$.01-9.99	2	5/3
$10-49.99	3	4/2
$50 and over	6	2/1

The ready availability of those line items qualifying for stockage relates to logistics readiness since required items not readily available extend the down time of combat essential equipment.

A commonly used measurement of General Account performance and responsivelness to logistics is the RO fill rate which has a CMC-established goal of 75%. In other words, three out of every four demands for stocked items should be filled in order to achieve the aforementioned goal.....
The funding provided to the General Account is primarily influenced by the total I MAF budgetary process.......
An over $2.2 milion deficiency is projected for the General Account at the current fiscal year's end. Since 1 February, the dollar value of the General Account's stocked items has increased by $.5 million to approximately $5.5 million. If the funding provided remains constant, this increase in stocked items will generate an even greater deficiency than projected with the 1 February 1979 data. The projected deficiency is further compounded by the fact that Requisitional Authority (RA) dollars exceeded PE dollars during the first half of this fiscal year. This situation allows for using units to requisition at a greater rate than the General Account has comparable funds to replenish.......

2. Assistant Chief of Staff, Comptroller, HQ, FMFPac memoramdum 12F/sld of 8 Sep 1978 to Force Supply Officer, HQ, FMFPac

Subj: Financial Management of SMU Inventory

1. On several occasions during the past few months I have attempted to start actions which would improve financial management of our SMU inventories. In May I proposed two messages concerning free issues from the General Account. My purposes were to reduce the amount of on hand excesses and improve material readiness of the Force. You did not concur with the messages. I did not agree with your logic. I am still concerned over the exhorbitant and wasteful costs of carrying excess inventory.

2. On various occassions we have discussed inventory investment criteria for the General Account. I still think our current procedures are unsatisfactory and inefficient. It is imperative that we take action to reduce stock, turn inventory more frequently, and establish an economical investment criteria.

3. The above issues remain unresolved........

E. DEMAND PREDICTION

Assistant Chief of Staff, Comptroller, HQ, FMFPac, Memorandum12/jwb of 27 Sep 1978 to to Force Supply Officer, HQ, FMFPac

Subj: Financial Management of SMU Inventory

1. There are plenty of statistics available to prove that the present RO computation is a poor predictor of demand. The difference between RO fill and total fill is prima facie evidence that we can't predict demand. Moreover, if one just studies the migrations out of and into RO status, it's obvious that a problem exists.

2. Without question, we cannot afford the stockage policy imposed upon us now. I would't recommend compliance if we could afford it. The inventory prediction criteria we use is at least 25 years behind the times.

3. I reject the suggestion that we must study the problem more. Better methods are available now. Prediction models run by 3rd FSSG using RIMSTOP show we could live with substantially lower inventories if we adopted EOQ.

4. We should not wait to solve all supply problems at once. Stockage policy today is unsupportable. Correcting that portion of the system is not suboptimizing the problem.

5. The time to act is now. I heartily recommend an early FMFPac conference of Financial and Supply managers to develop specific recommendations for CMC.

F. EXCESSES/DEFICIENCIES

Force Supply Officer, HQ, FMFPac, Enclosure to 21/CSS/lem 4400 of 20 Sep 1978 to Assistant Chief of Staff, Comptroller, FMFPac

SUMMARY OF "TROUBLE SPOTS"

The ongoing discussions between Colonel Loehe and myself have centered around timeliness of setting guidelines to govern the inventory management of the SMU's--not on whether such guidelines should be established.

Mr. Patrick has completed the first iteration of a study on this same matter. His study deals primarily with the potential effect use of "Economic Order Quantity Theory" would have on the General Accounts. There is merit in what he has produced so far--there are also some fairly serious shortfalls in his conclusions. The primary cause of these shortfalls is clearly a misunderstanding/misinterpretation of current stockage criteria--not his logic. Copies of these studies have been forwarded to the three interested field activities for their information/retention.

At virtually the same time HQMC approved the concept of basing stock levels on the unit cost of an item vice the previously used "guide" nuber of movements per year. This concept was tested in the SMU of the 1st FSSG and the program was, with several minor program errors, authorized for use by the rest of the SMU activities. This approach has produced significant changes in the manner of setting stock levels and, in turn inventory management at the "users" level. Total benefits from this concept are still not absolutely definable--nor will they be for some time in the future.

We, in the military, have the unenviable mission of not only stocking those bits and pieces the customer desires--we also have to stock and be ready to issue those combat essential stocks and equipments the customer will need in the event of various contingencies. Our demand patterns are based more on the vastly fluctuating commanders' desires on a daily/weekly basis than on long range requirements of the total force. Because recent command direction has focused on maintenance, repair productivity does not give us the license to "hold a sale" on individual equipment.

One might quibble with the technology of "holding a sale" were it not for the brutal fact that the declaration of such things as individual equipment into the currently established "excess program" results in about 10 cents return on the dollar. Worse yet, however, is the awesome fact we soon turn around and purchase the item once again, based upon immediate

demand, and pay far in excess of the original purchase price--and far more than we would have expended in storage costs to retain the item.

Yet another facet of the problem occurs when new and creative programs are instituted. One excellent example is the recently established CRESP program throughout FMFPac. If we are to "lock up" 30% or more of the Motor Transport assets in semi-dead storage what happens to the current on hand stocks of repair parts? Do we allow them to become "excess"? Do we use a "multiplier" for the future usage data which is based on only 70% of the fleet? What actions are to be taken by the inventory manager to "properly" hand the vast number of line items this decision could touch? The concept is valid and should be pursued. The stockage criteria must, however, take such a program into consideration--and be able to justify its position.

Under currently instituted reporting procedures there are various quantity and dollar value figures which are suspect by their very definitions. It leads to double counting of the same assets and therefore leads to inflated statistics being generated by the field activities and, even worse, being utilized by senior commands in trend analysis, fiscal decisions, managerial evaluations, and comparisons.

For the past few months the entire excess program has been placed under a moritorium pending "rewrite" of the total program. The revision is intended to not only speed up the timely reporting of actual excess assets but also the receipt of actual credit returns to the user.

Perhaps the most critical factor, however, is the inadequate data base currently being used in the decision process resulting in actual excess declarations. It is, by regulation, limited to the most recent twelve month period. Many, if not most, items of supply and equipment have cyclical fluctuations exceeding such a time frame. The DoD directive on Economic Retention Quantity (ERQ) is geared to 36 months worth of the average monthly requirements--but those same requirements are wiped from the record when they are only 12 months old. Under such a system, for example, field jackets whose cyclical demand exceeded a twelve month period could easily end up being declared excess and actually disposed of prior to once again receiving a hard requirement from an organic account.

A review of the excess stature over the last year indicates that almost fifty percent reduction in dollar amounts currently being reported. In that same vein, the dollar figures reported/utilized by headquarters personnel are at variance with those utilized by various command echelons within FMFPac. One of the prime causes of this disparity is the manner in which line items and money value are reported. The actual figures are extremely soft and lack the precision the report implies. The previously mentioned "double counting" is only one of the problem areas we must identify and correct. The above discussion is not to substantiate a position of there being no need for further study and effort being applied to inventory management and control. Rather it is to provide a background to the actual problem areas impacting on the entire program.

Rather than establishing goals and objectives for the preciseness desired by the Comptroller as a starting point there is a need to identify the causal factors leading to the situation.

Initially I think the need for a more meaningful data base is paramount. We need to be able, by machine process, to review demand/usage data over the previous three years vice the previous 12 months available to us under the current program. Using such data for analysis, managerial expertise could then be brought to bear on what actually causes a build up in excess stocks. Is is change in demand patterns? Is it interchangeable items? Is it lack of properly identifying non-RO items held for initial provisioning requirements? Is it caused by seasonal requirements? Is it a function of organizational unit roll back programs? Is it related to a shortfall in the credit returns program?

Without such a data base, the managerial decisions that must be made will not have the prime requirement upon which those decisions must be based.

G. SUMMARY

The above excerpts document a series of problems which are large in scope with no one single solution. One of the more attractive solutions to the General Account funding and inventory problems is that of creating a "corpus" and making the General Account a "stock fund". The RA = PE equality has been blamed for causing deficiencies and excesses, yet at the same time praised for providing structure to the financial and supply systems. The question of PE not equal to RA as a financial management tool has not been resolved as evidenced by the comments throughout. The question of separate funding of Table of Equipment deficiencies and RO

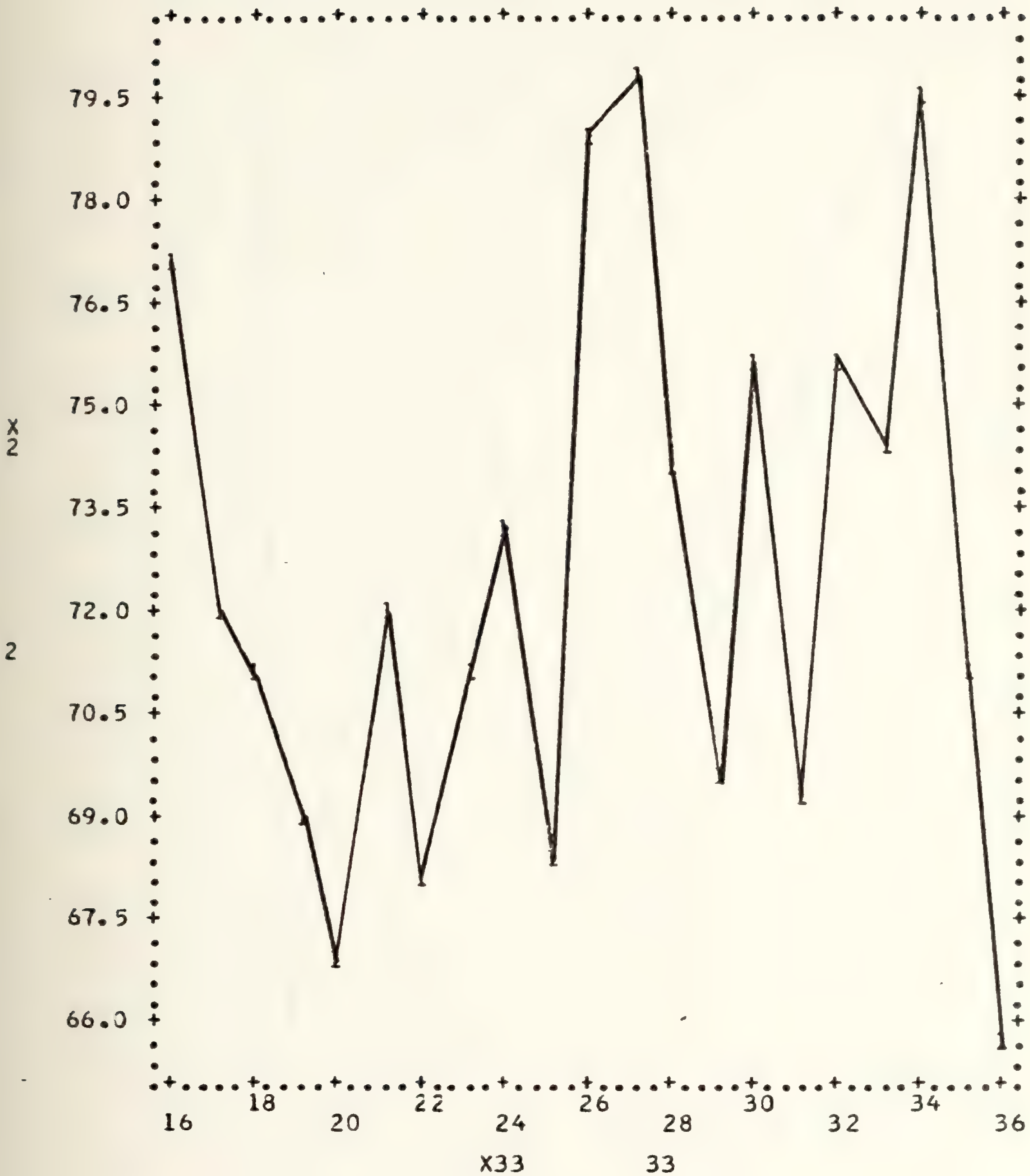
deficiences continues as a controversy today. Underlying all the questions is the more general problem of being able to state quantitatively the relationships in SASSY with respect to operating and funding the General Accounts. This was a recurrent theme in the literature reviewed. It is believed that many of the problems cited would be reduced if the various principals at the various echelons of command had a set of validated models which quantified the SASSY relationships and aided in making decisions.

APPENDIX B: GRAPHS OF SASSY VARIABLES

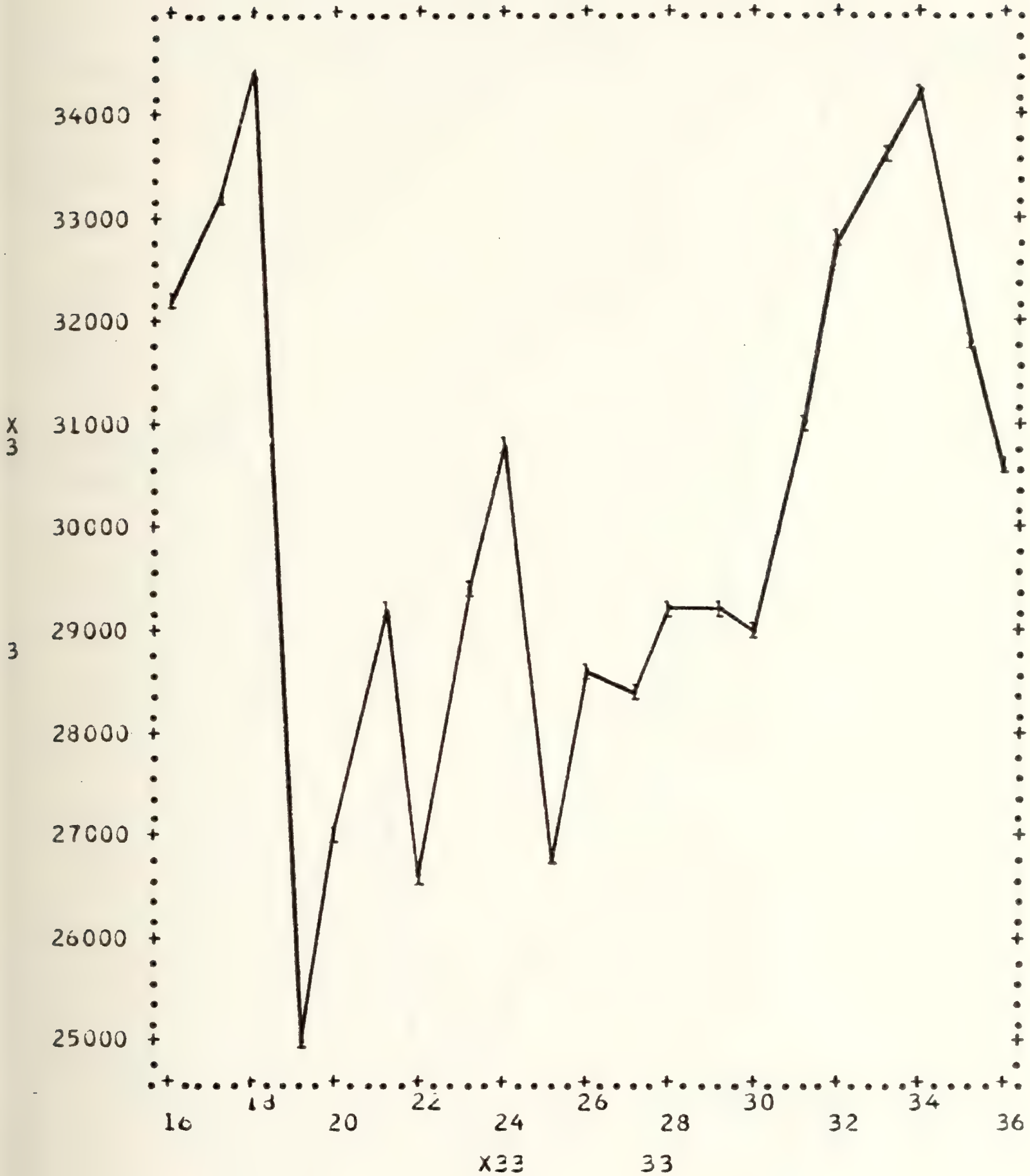
The graphs presented in this appendix are of each one of the SASSY variables used in development of the regression equations. They represent the raw data available in SASSY. Note that the x-axis is numbered from 16 to 36 and represents the number of the period. The graphs, therefore, portray changes in the values of the variables over time. The three months of the 24 month period used for the lagged variables are not shown. Period 16 corresponds to January 1979 and 24 corresponds to September 1979 and 36 corresponds to September 1980. The purpose for including these graphs is provide a visual sense of the apparent randomness that one sees when viewing SASSY Management Unit Operations from the perspective of the OIC of the SASSY Management Unit, and to support the decision to undertake a extensive series of regression equations.

V1--Complete Fill Rate

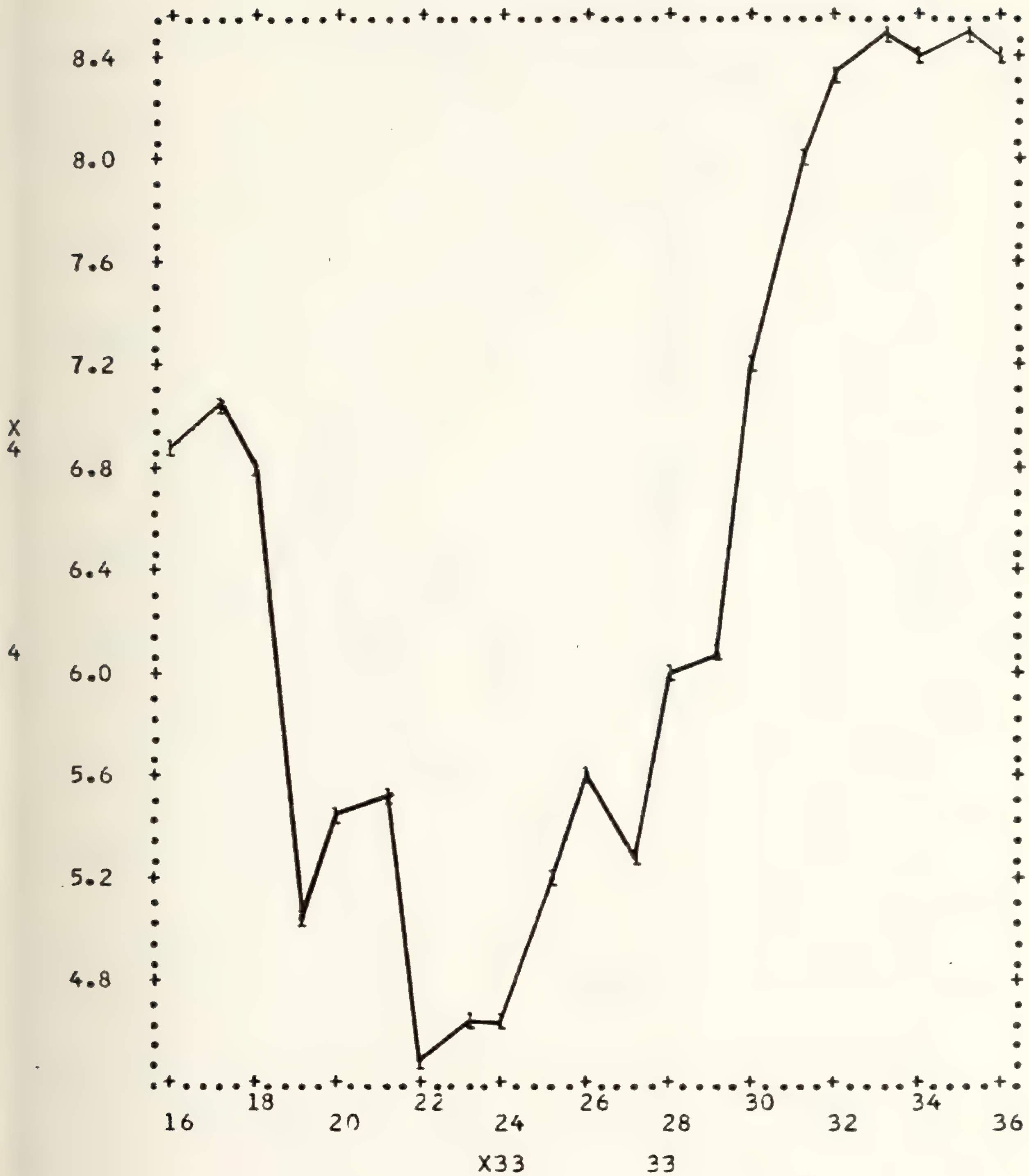
V2--RO Fill Rate



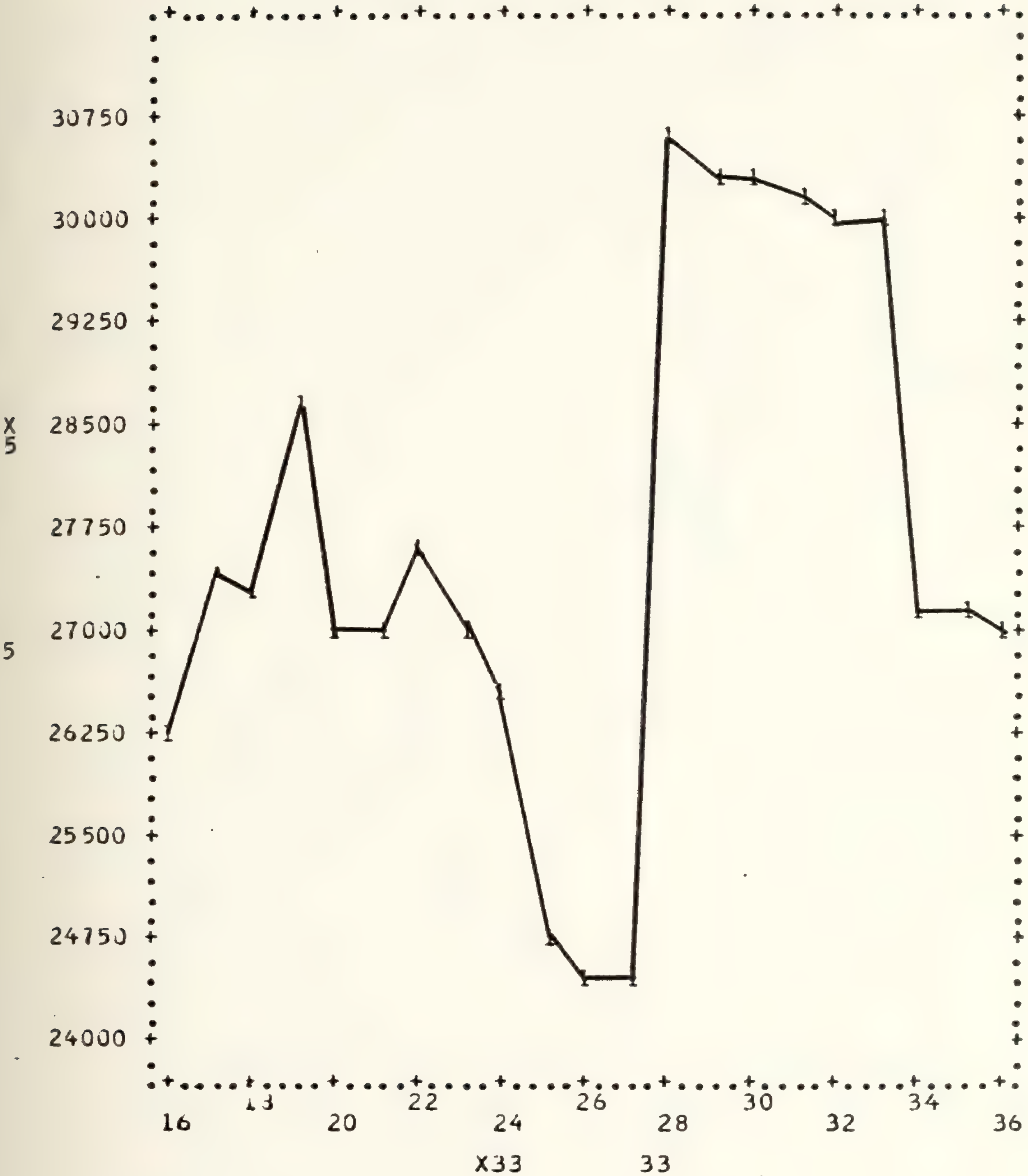
V3--Number of NSN's on Hand



V4--Dollar Value of NSN's on Hand

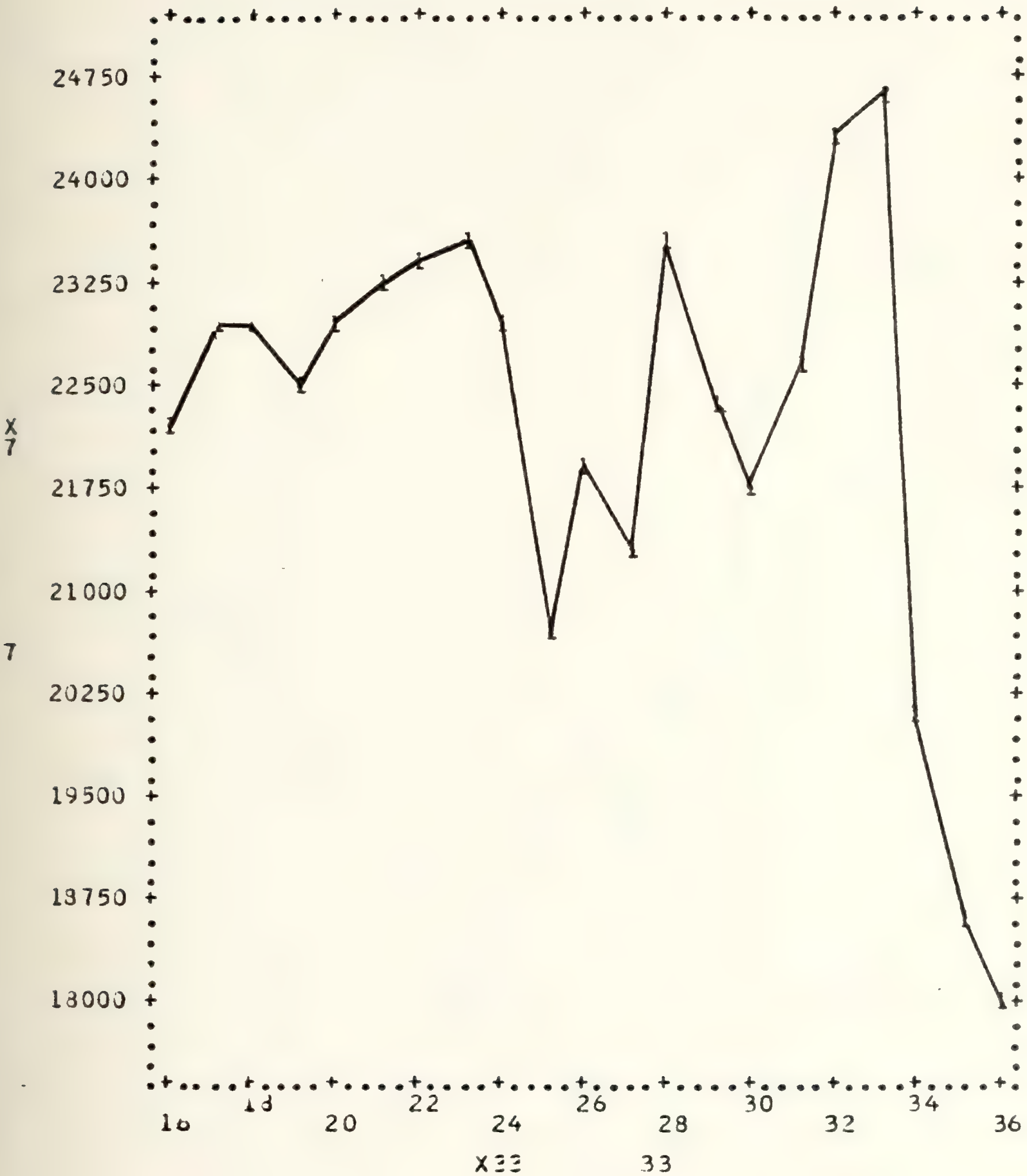


V5--Number of NSN's with an RO

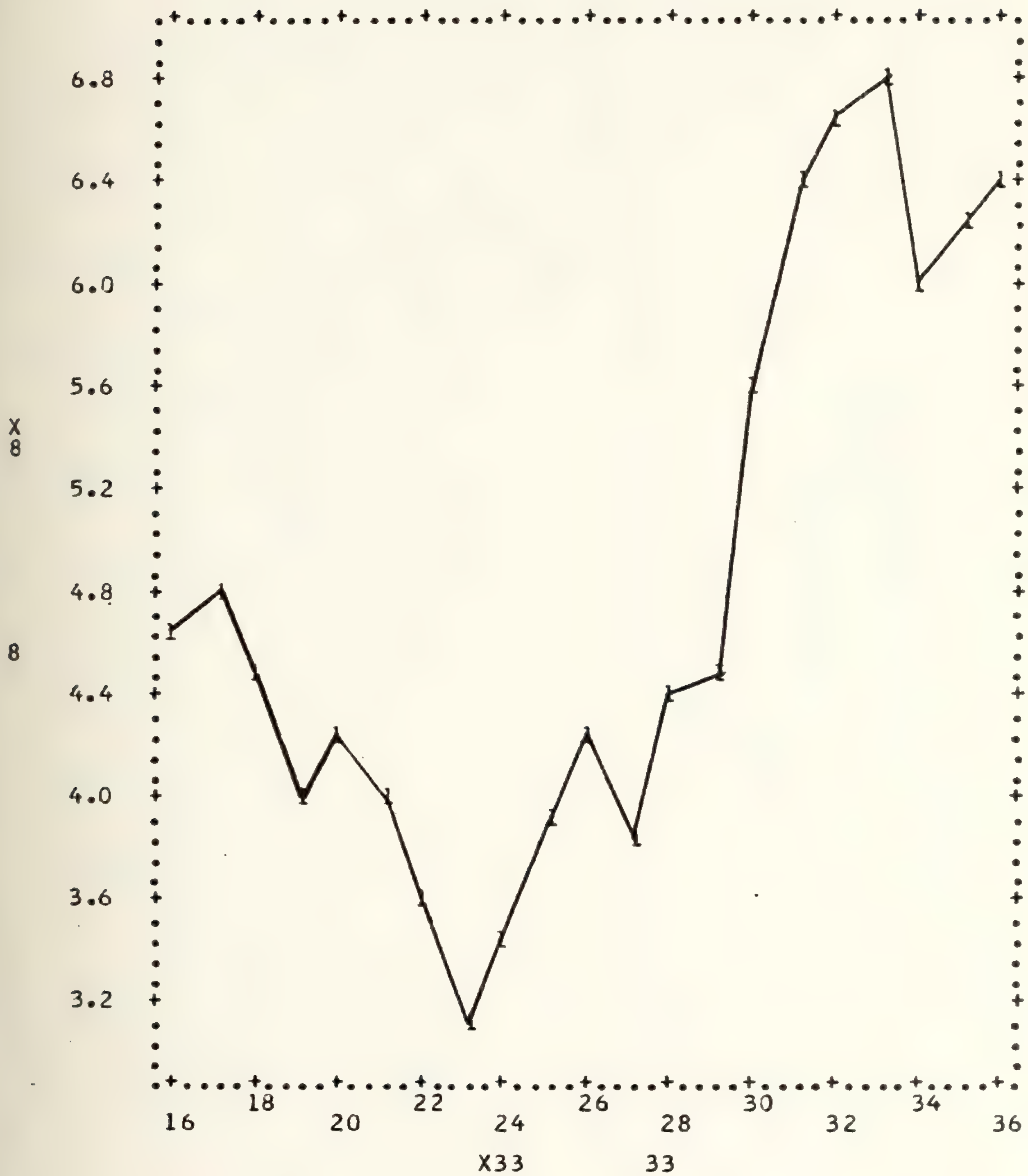


V6--Dollar Value of NSN's with an RO

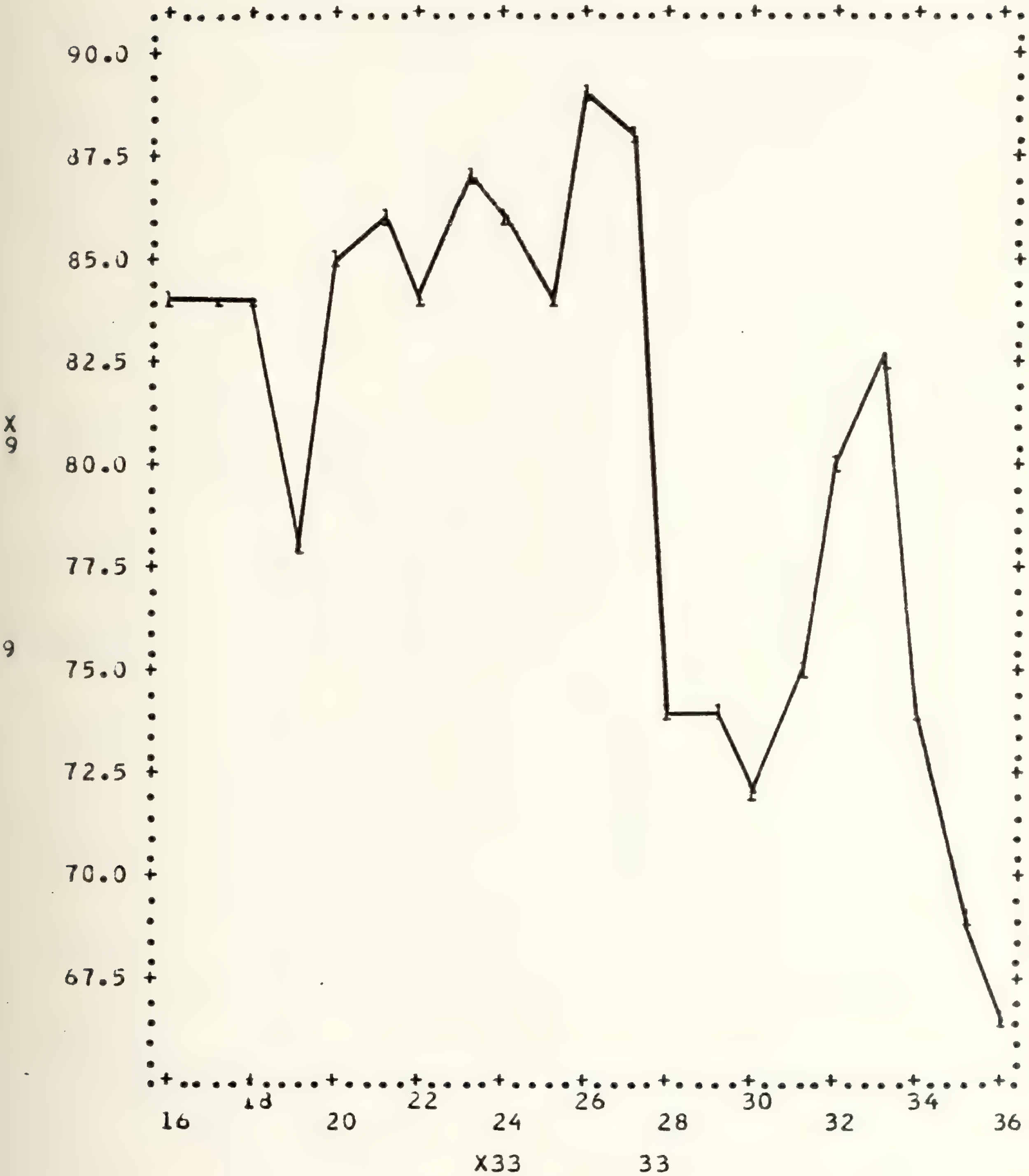
V7--Number of RO NSN's on Hand



V8--Dollar Value of RO NSN's on Hand

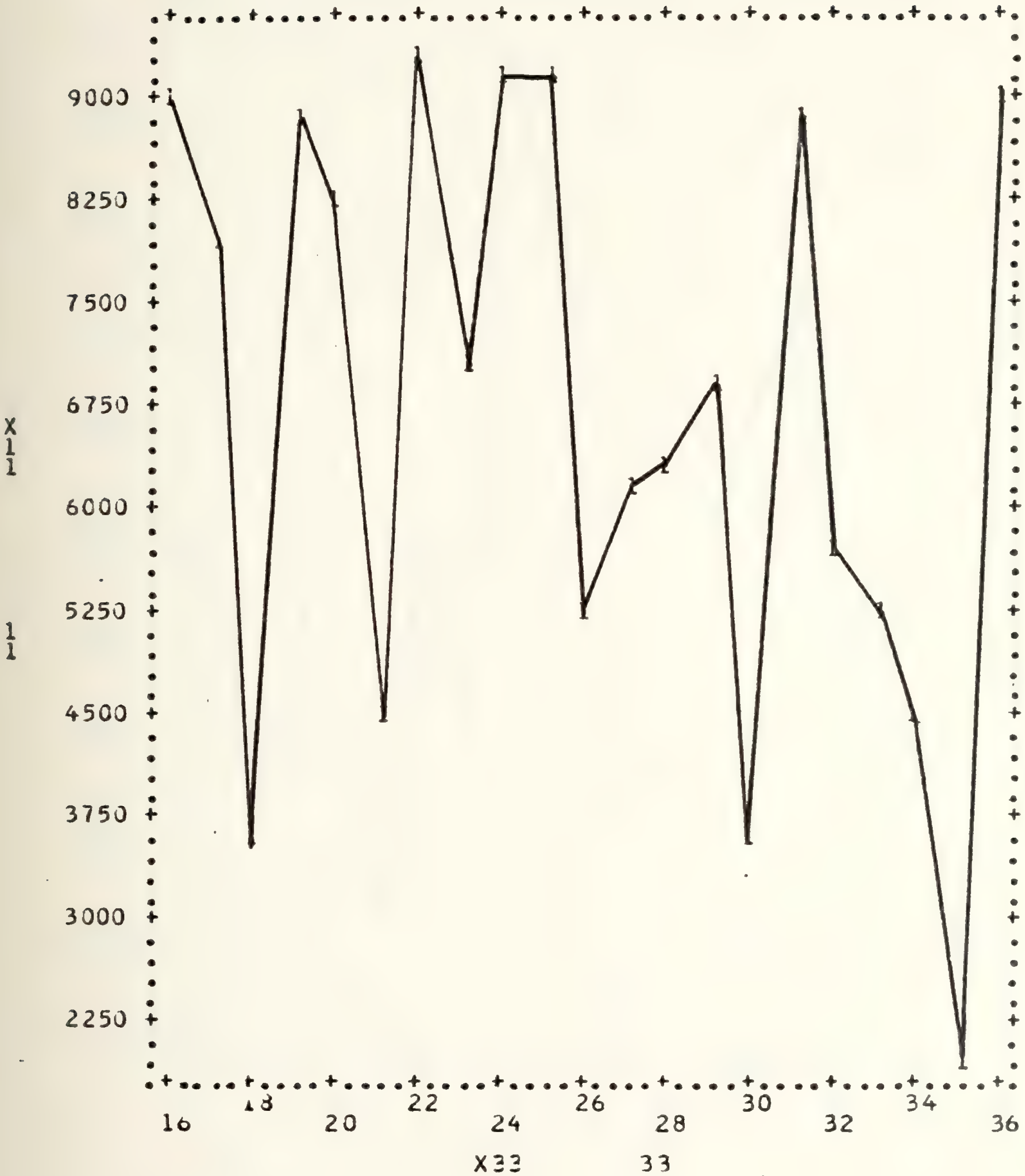


V9--Percent Availability of RO NSN's on Hand

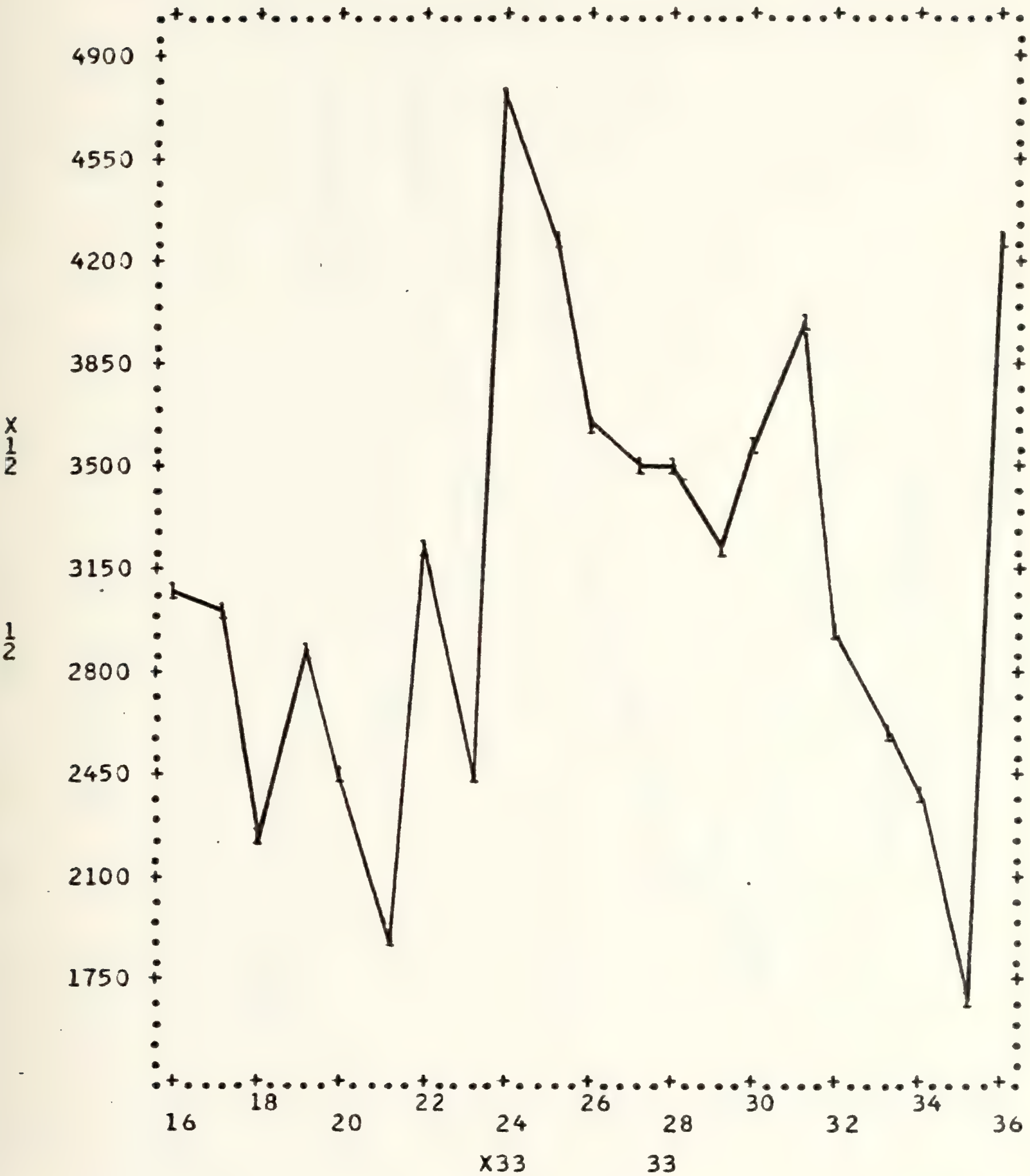


V10--Receipts from Due

V11--Number of NSN's with Dues

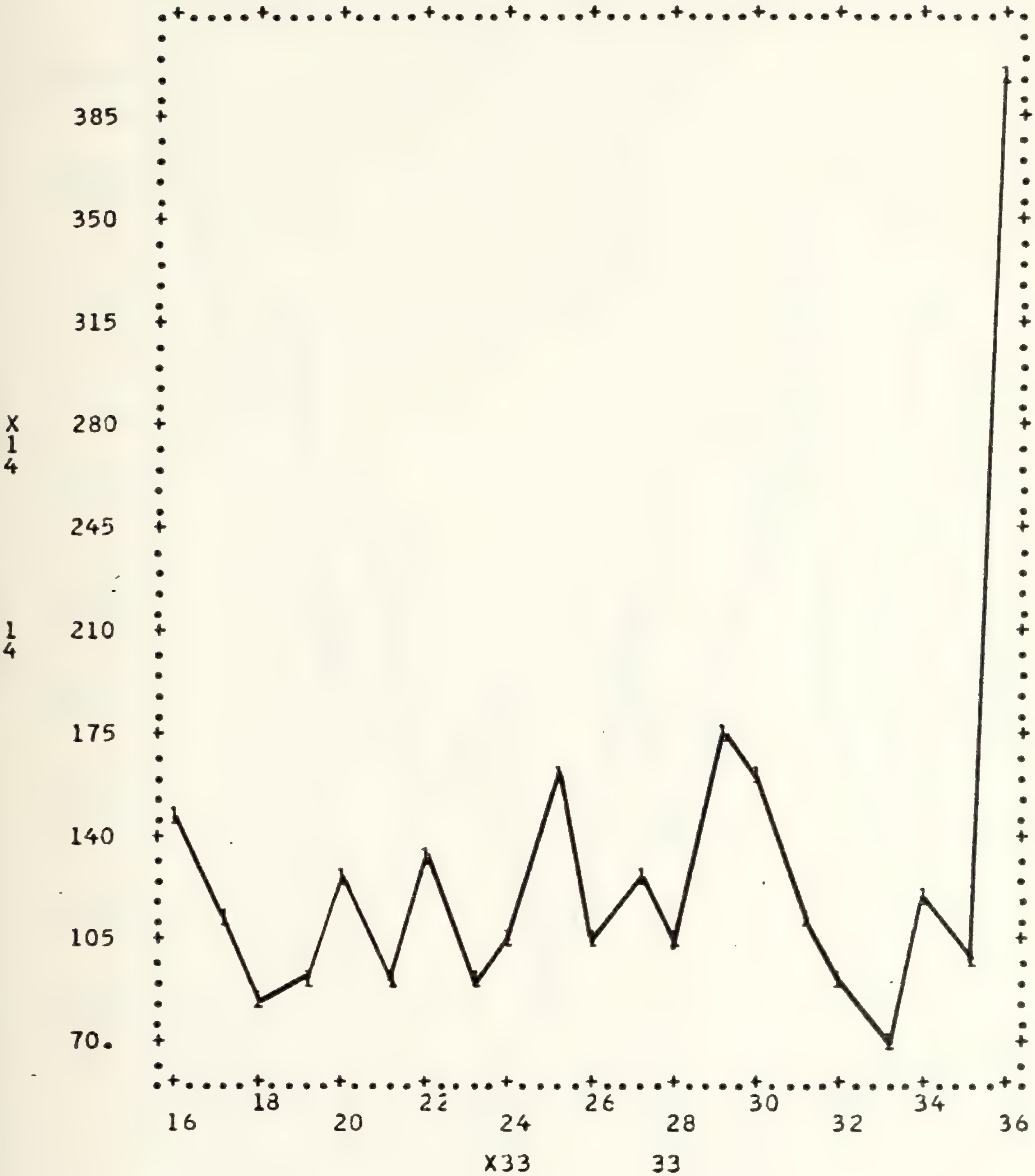


V12--Dollar Value of NSN's with Dues



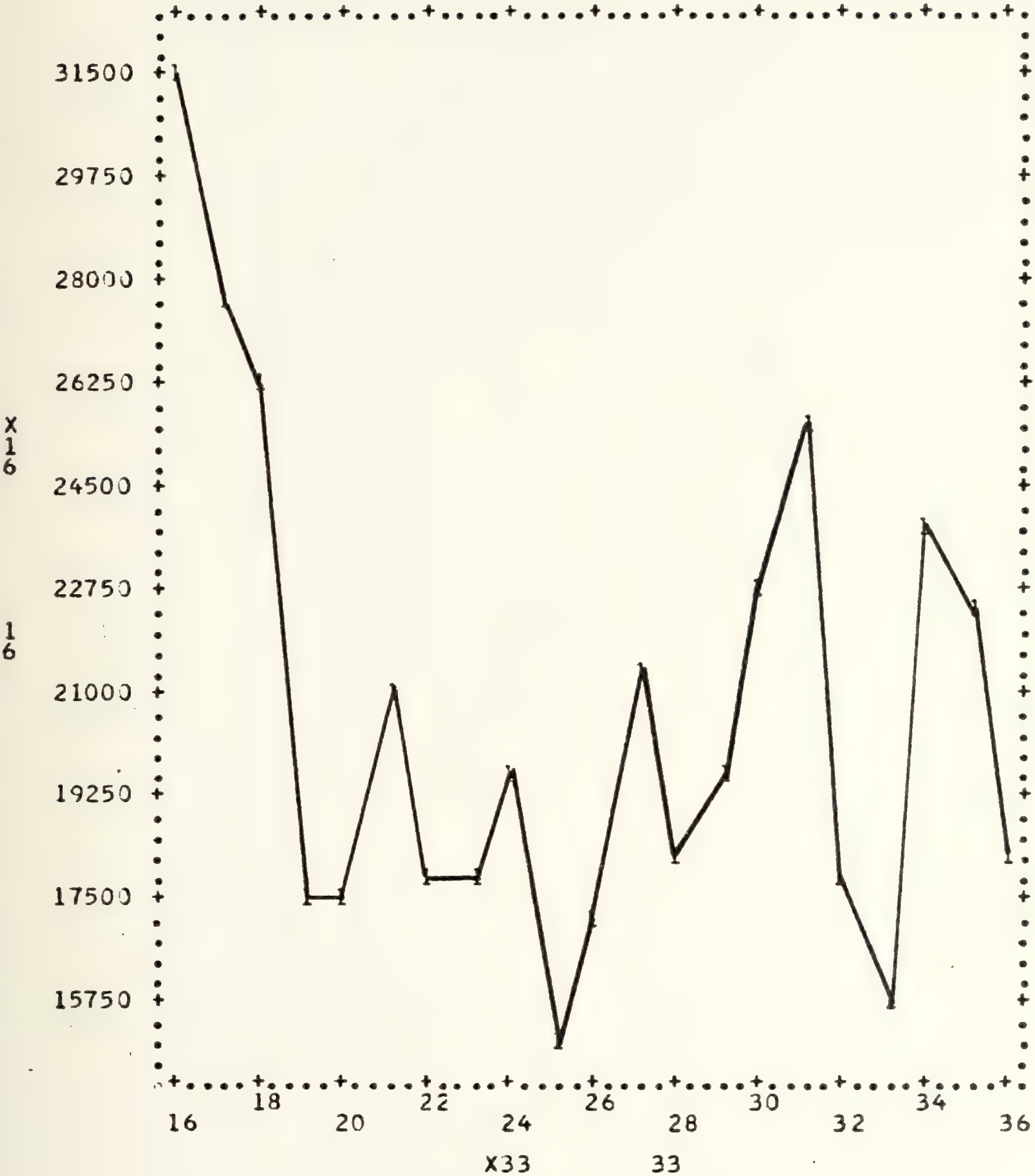
V13--Number of NSN's with Excess Dues over Req + RO

V14--Dollar Value of Excess Dues Over REQ + ERQ

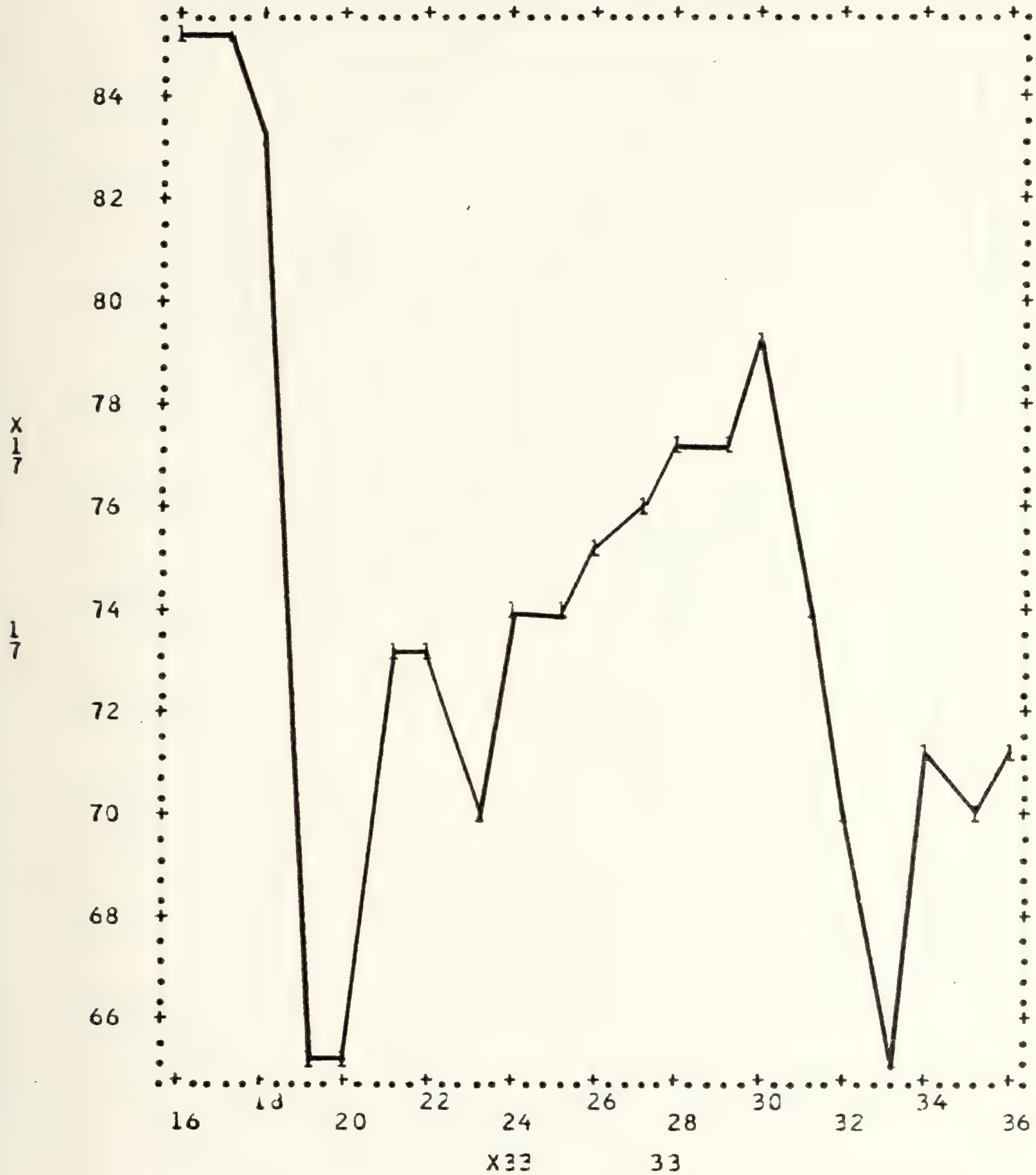


V15--Total Demands

V16--RO Demands

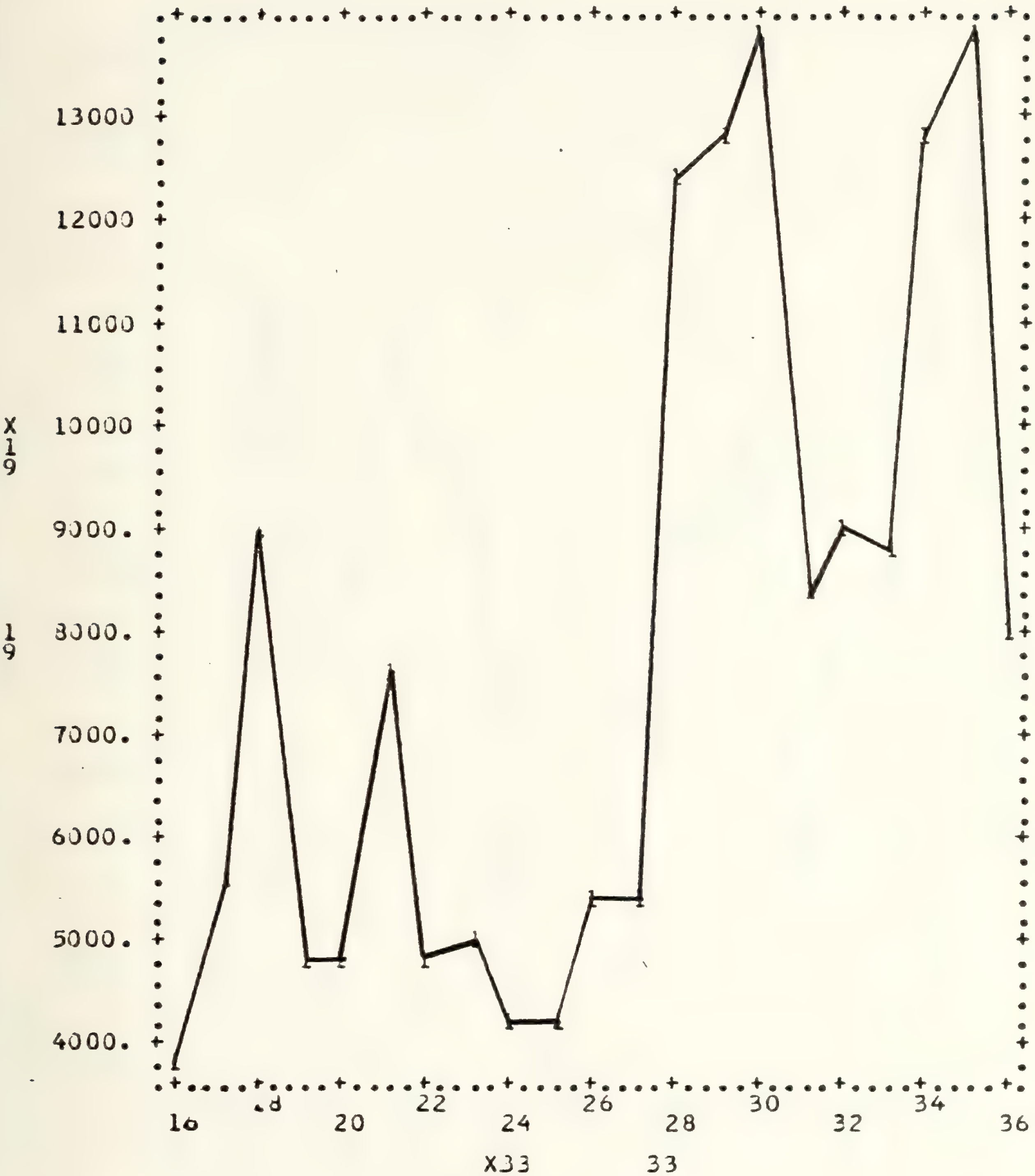


V17--Percent Demands for RO Items



V18--Number of Backorders

V19--Number of NSN's with RO REQ Not on Order

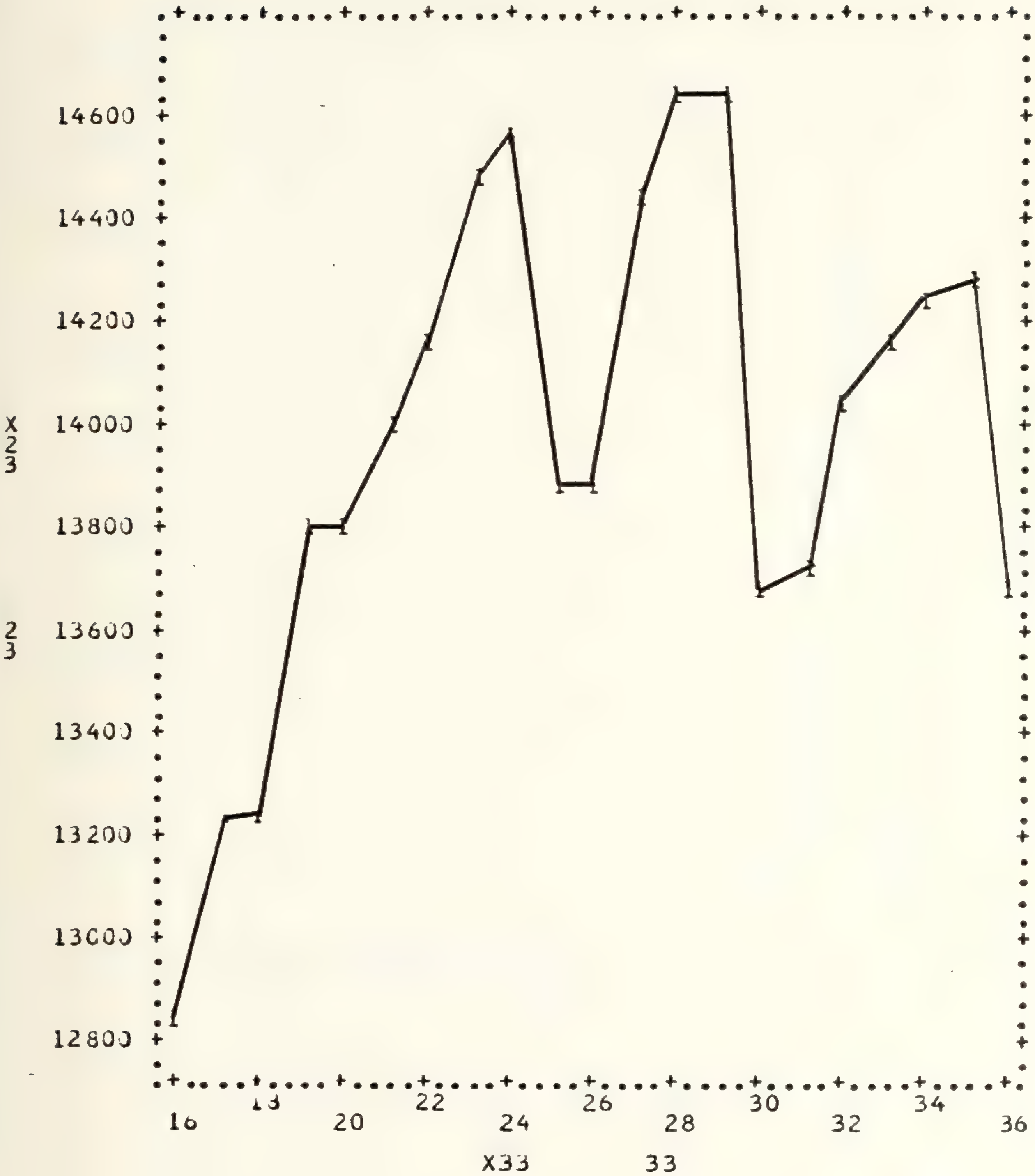


V20--Dollar Value of NSN's with REQ But Not on Order

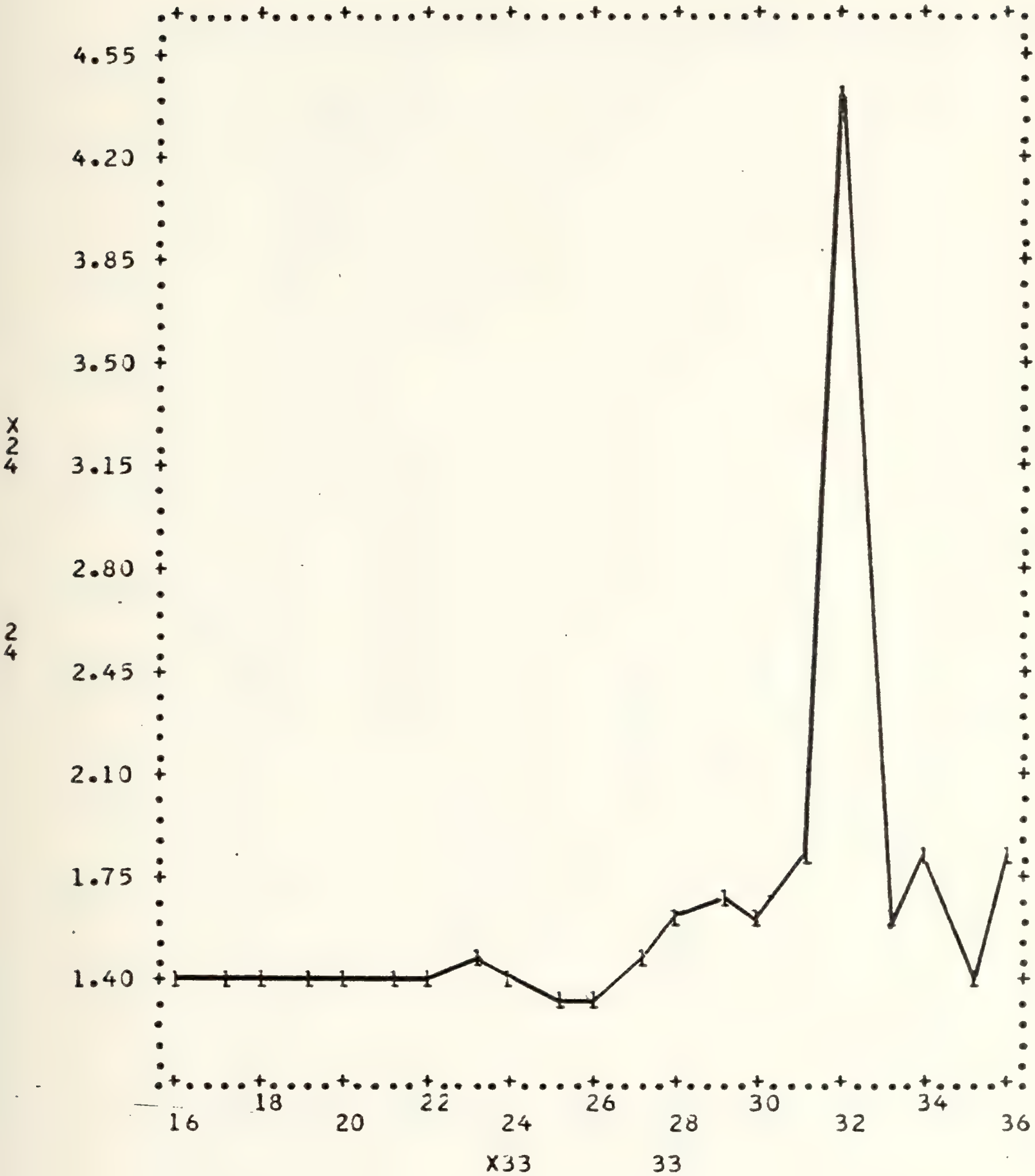
V21--Number of NSN's on Hand Over RO + ERQ

V22--Dollar Value of NSN's on Hand Over RO + ERQ

V23--Number of NSN's with 30 Day Usage

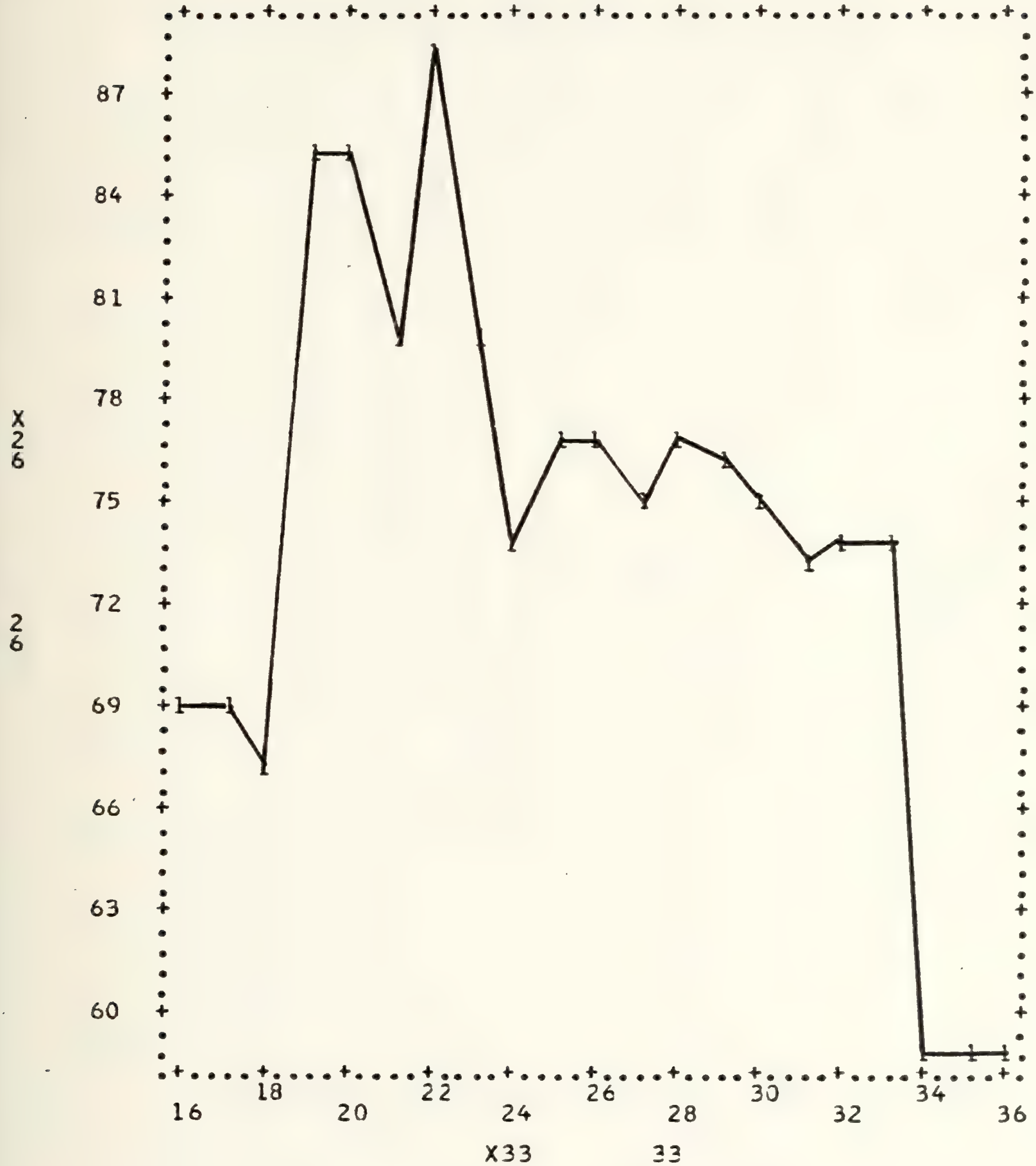


V24--Dollar Value of NSN's with 30 Day Usage

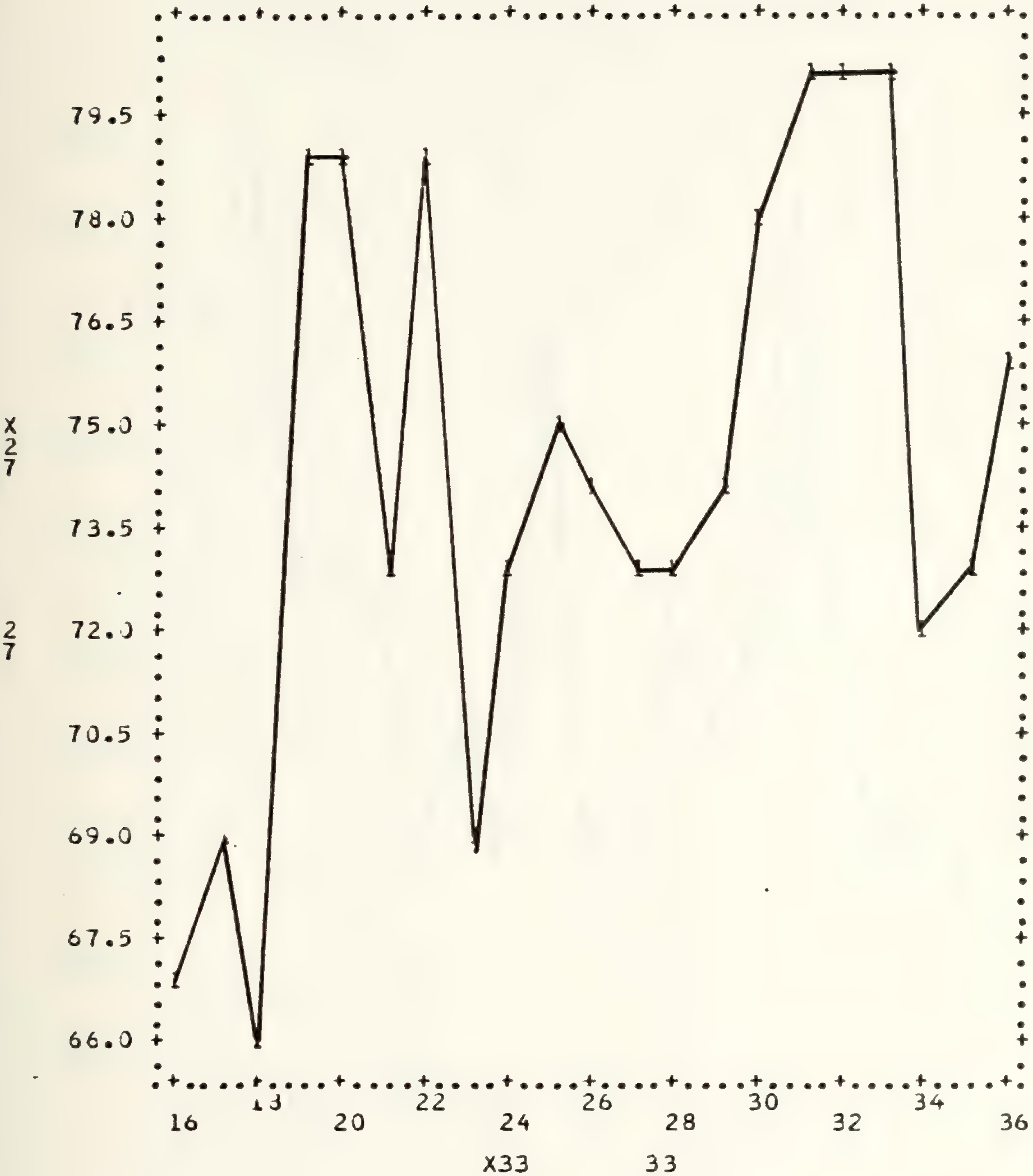


V25--Warehouse Issue Confirms

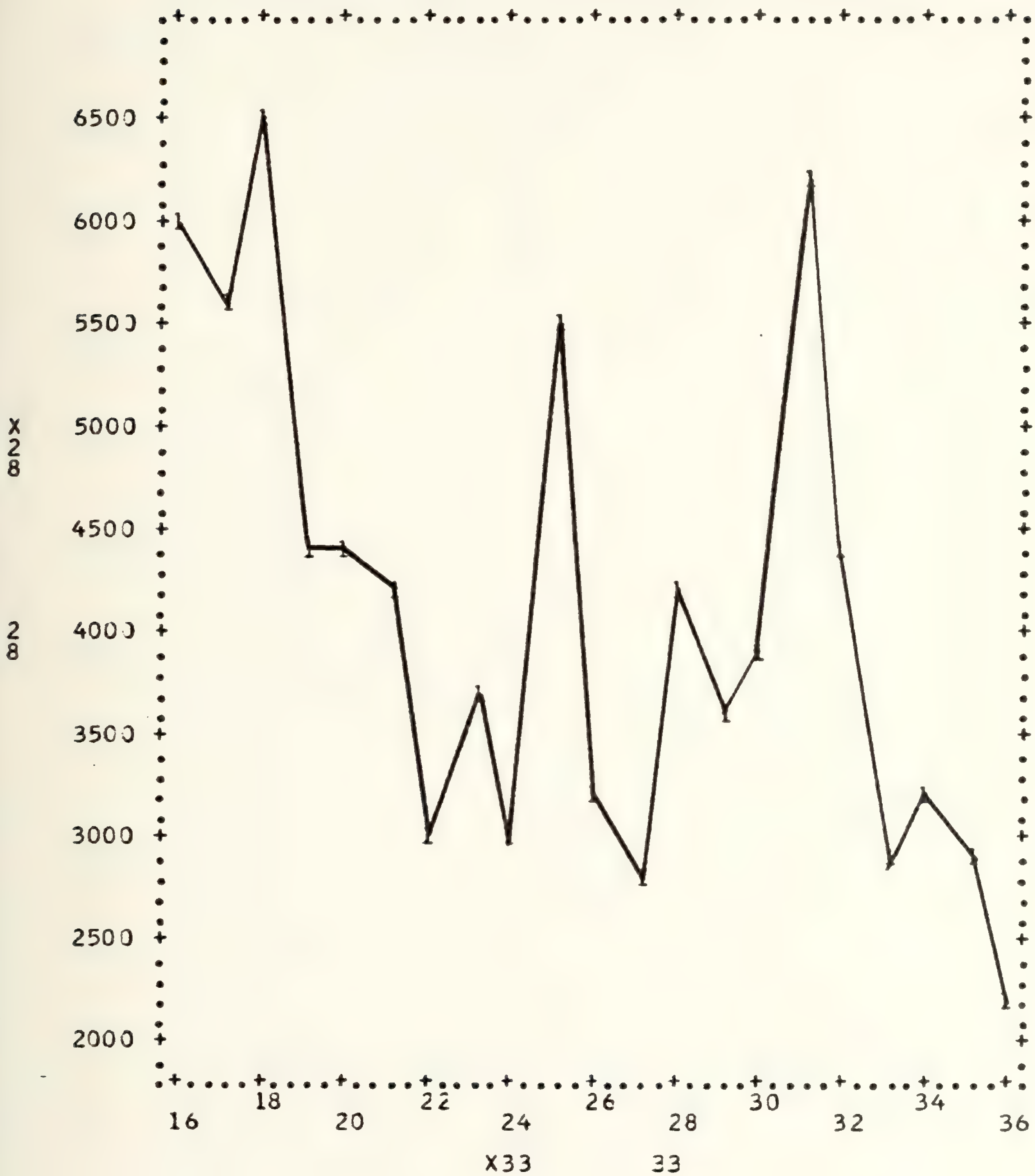
V26--Percent Total NSN's on Hand Which Have an RO



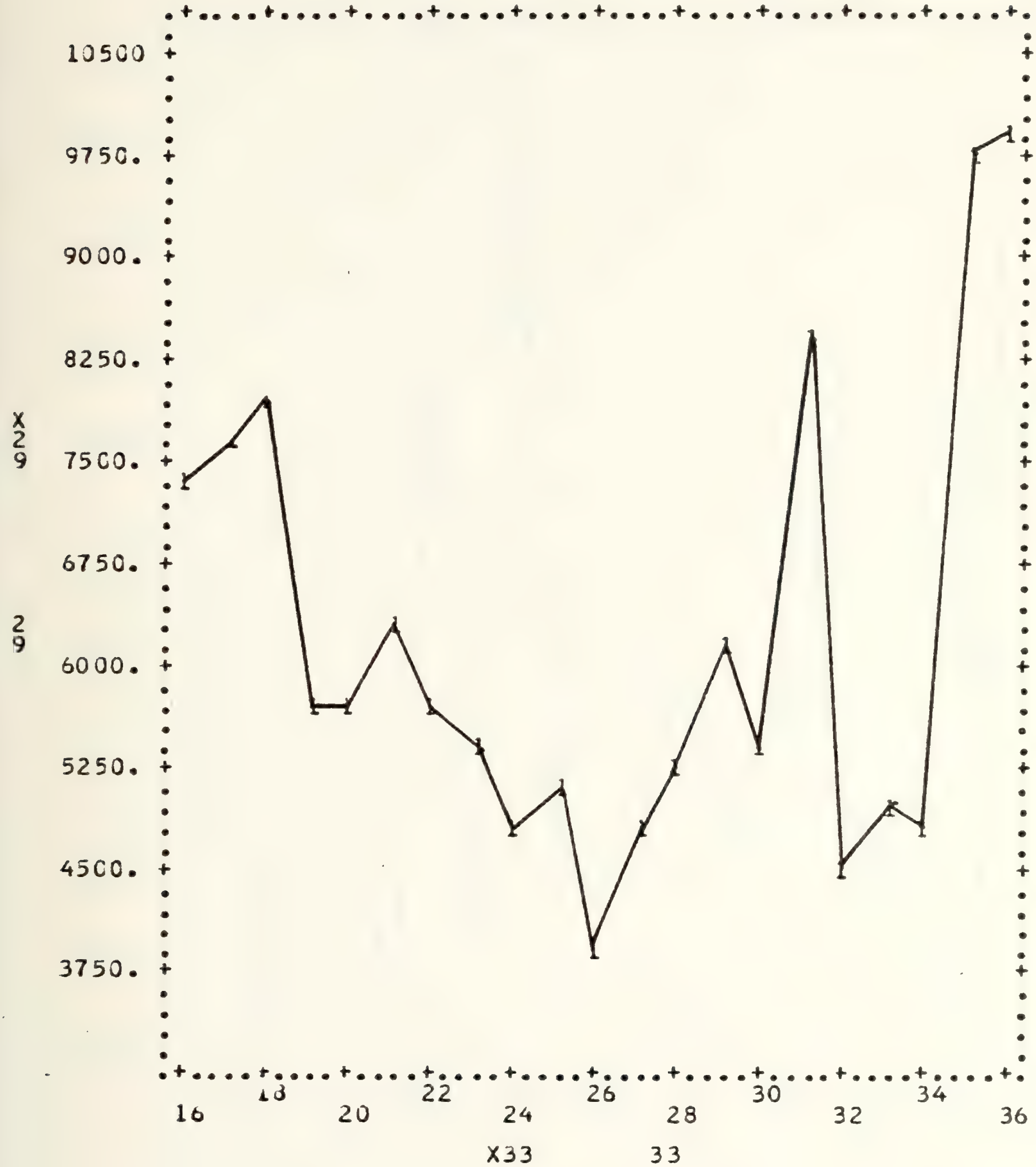
V27--Percent Total Value of NSNfs on Hand Which Have an RO



V28--Regular and Hot Item Backorders Released

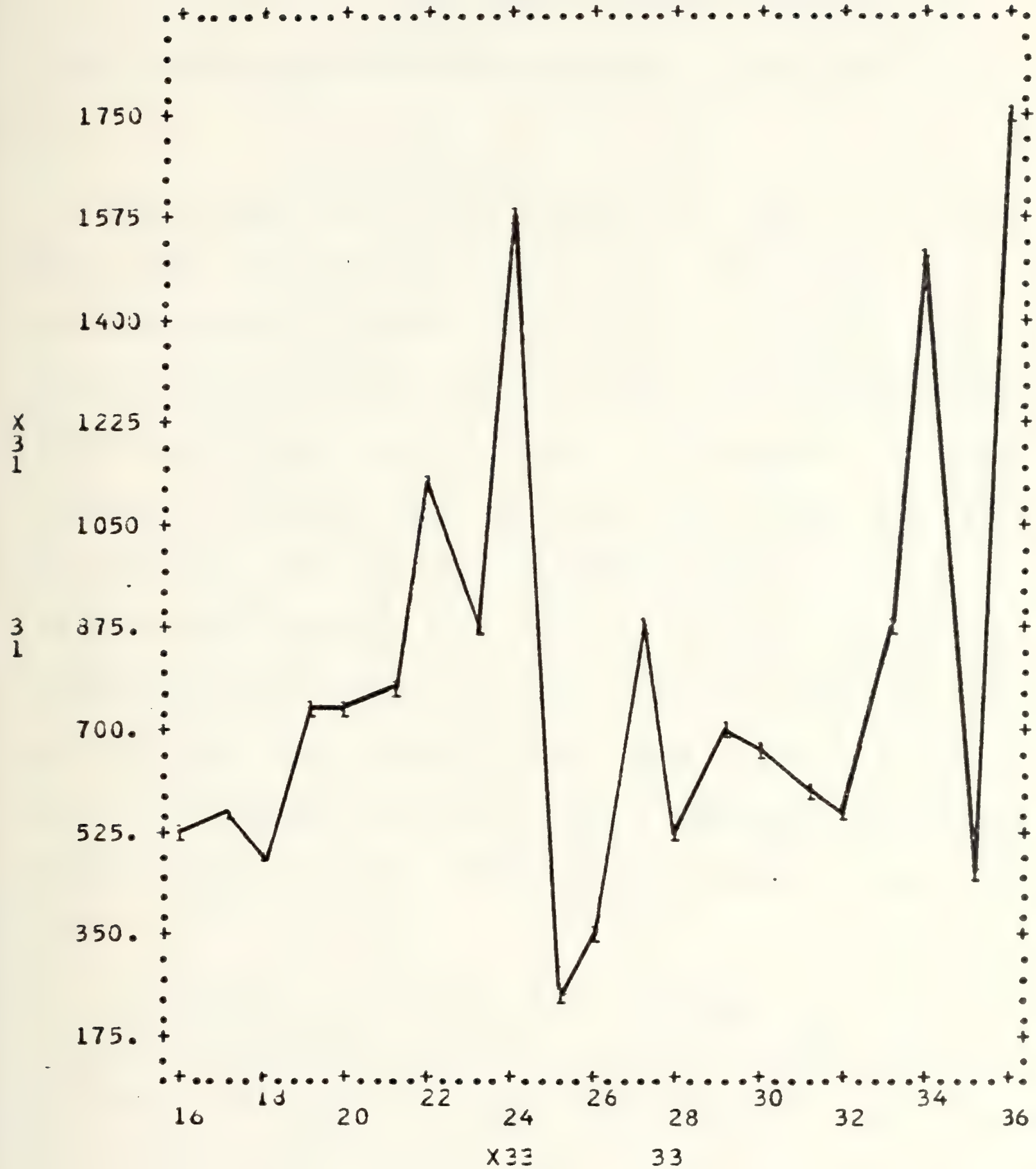


V29--Regular and Hot Item Backorders Established



V30--AOA Dollar Value

V31--A3A Dollar Value



APPENDIX C: TI-59 PROGRAMS FOR PREDICTING THE VALUES OF SASSY VARIABLES

TI-59 PROGRAMS FOR PREDICTING THE VALUES OF SASSY VARIABLES

The programs herein are designed for ease in use and have been tailored for the Texas Instruments TI-59 programmable hand calculator. A great convenience of the TI-59 is that it accepts magnetic cards. It is recommended that each program be keyed into the calculator and then recorded on a magnetic card for future use. Once that this has been done, all that is required to use the programs is to insert the magnetic card, key the variable values into the appropriate lettered registers, and then press R/S. The prediction for the variable whose equation was on the card will appear almost instantly. Each program on the pages following has a small diagram of ten lettered boxes as below:

A'	B'	C'	D'	E'
A	B	C	D	E

As an illustration, the equation for V1 is shown on the magnetic card as

V5L1	V5L2	V7L1		
V15	V17	V29	V11	V12

Each variable listed is placed in its corresponding lettered register. Note that the V101 shown as a predictor variable for V1 in the Chapter IV equation is really V11/V12. The programs were written so that V11 and V12 are to be entered separately rather than having the user have to provide their quotient. Note that V5L1, V5L2 and V7L1 are lagged variables. The notation for lagging V5 one month, two months and three months respectively is V5L1, V5L2, V5L3. Thus if one were to be predicting V1 for period 48 (September 1981), V5L1 would refer to the V5 value for August, V5L2 would refer to July and V5L3 would refer to June.

V1--Complete Fill Rate

000	76	LBL
001	11	A
002	65	×
003	93	.
004	00	0
005	00	0
006	00	0
007	06	6
008	08	8
009	06	6
010	00	0
011	09	9
012	05	5
013	95	=
014	42	STO
015	01	01
016	91	R/S
017	76	LBL
018	12	B
019	65	×
020	93	.
021	03	3
022	07	7
023	00	0
024	06	6
025	08	8
026	08	8
027	95	=
028	42	STO
029	02	02
030	91	R/S
031	76	LBL
032	13	C
033	65	×
034	93	.
035	00	0
036	00	0
037	02	2
038	01	1
039	06	6
040	01	1
041	03	3
042	07	7
043	95	=
044	42	STO
045	03	03
046	91	R/S
047	76	LBL
048	14	D
049	42	STO
050	04	04
051	91	R/S
052	76	LBL
053	15	E
054	42	STO
055	05	05
056	43	RCL
057	04	04
058	55	÷
059	43	RCL
060	05	05
061	95	=
062	65	×
063	02	2
064	93	.
065	02	2
066	07	7
067	06	6
068	08	8
069	03	3
070	95	=
071	42	STO
072	05	05
073	91	R/S
074	76	LBL
075	16	A'
076	65	×
077	93	.
078	00	0
079	00	0
080	00	0
081	03	3
082	01	1
083	03	3
084	01	1
085	06	6
086	08	8
087	95	=
088	42	STO
089	06	06
090	91	R/S
091	76	LBL
092	17	B'
093	65	×
094	93	.
095	00	0
096	00	0
097	00	0
098	03	3
099	02	2
100	09	9
101	00	0
102	03	3
103	05	5
104	95	=
105	42	STO
106	07	07
107	91	R/S
108	76	LBL
109	18	C'
110	65	×
111	93	.
112	00	0
113	00	0
114	00	0
115	06	6
116	01	1
117	08	8
118	03	3
119	03	3
120	03	3
121	95	=
122	42	STO
123	08	08
124	91	R/S
125	06	6
126	01	1
127	93	.
128	01	1
129	06	6
130	01	1
131	06	6
132	85	+
133	43	RCL
134	01	01
135	85	+
136	43	RCL
137	02	02
138	75	-
139	43	RCL
140	03	03
141	75	-
142	43	RCL
143	05	05
144	75	-
145	43	RCL
146	06	06
147	75	-
148	43	RCL
149	07	07
150	75	-
151	43	RCL
152	08	08
153	95	=
154	91	R/S
155	81	RST

V5L1	V5L2	V7L1		
V15	V17	V29	V11	V12

V2--RO Fill Rate

000	76	LBL	041	09	9	082	05	05	123	85	+
001	11	A	042	01	1	083	91	R/S	124	43	RCL
002	65	×	043	06	6	084	76	LBL	125	05	05
003	93	.	044	08	8	085	16	A'	126	75	-
004	00	0	045	04	4	086	85	+	127	43	RCL
005	00	0	046	95	=	087	43	RCL	128	06	06
006	00	0	047	42	STO	088	07	07	129	95	=
007	07	7	048	03	03	089	95	=	130	91	R/S
008	02	2	049	91	R/S	090	65	×	131	81	RST
009	04	4	050	76	LBL	091	93	.			
010	07	7	051	14	D	092	00	0			
011	03	3	052	65	×	093	00	0			
012	08	8	053	93	.	094	04	4			
013	95	=	054	00	0	095	02	2			
014	42	STO	055	00	0	096	00	0			
015	01	01	056	02	2	097	09	9			
016	91	R/S	057	03	3	098	01	1			
017	76	LBL	058	02	2	099	06	6			
018	12	B	059	03	3	100	95	=			
019	65	×	060	05	5	101	42	STO			
020	93	.	061	02	2	102	06	06			
021	00	0	062	95	=	103	91	R/S			
022	00	0	063	42	STO	104	07	7			
023	00	0	064	04	04	105	05	5			
024	05	5	065	91	R/S	106	93	.			
025	07	7	066	76	LBL	107	04	4			
026	07	7	067	15	E	108	03	3			
027	09	9	068	42	STO	109	01	1			
028	04	4	069	07	07	110	05	5			
029	04	4	070	65	×	111	85	+			
030	95	=	071	93	.	112	43	RCL			
031	42	STO	072	00	0	113	01	01			
032	02	02	073	00	0	114	85	+			
033	91	R/S	074	04	4	115	43	RCL			
034	76	LBL	075	04	4	116	02	02			
035	13	C	076	08	8	117	75	-			
036	65	×	077	04	4	118	43	RCL			
037	93	.	078	08	8	119	03	03			
038	00	0	079	01	1	120	75	-			
039	00	0	080	95	=	121	43	RCL			
040	01	1	081	42	STO	122	04	04			

V31				
V16	V21	V28	V29	V30

V3--Number of NSN's on Hand

000	76	LBL
001	11	A
002	65	×
003	93	.
004	09	9
005	03	3
006	08	8
007	05	5
008	04	4
009	03	3
010	95	=
011	42	STO
012	01	01
013	91	R/S
014	76	LBL
015	12	B
016	65	×
017	93	.
018	06	6
019	04	4
020	05	5
021	03	3
022	03	3
023	05	5
024	95	=
025	42	STO
026	02	02
027	91	R/S
028	76	LBL
029	13	C
030	65	×
031	06	6
032	03	3
033	93	.
034	05	5
035	05	5
036	08	8
037	04	4
038	95	=
039	42	STO
040	03	03
041	91	R/S

042	76	LBL
043	14	D
044	65	×
045	04	4
046	02	2
047	93	.
048	06	6
049	07	7
050	04	4
051	01	1
052	95	=
053	42	STO
054	04	04
055	91	R/S
056	01	1
057	09	9
058	06	6
059	07	7
060	93	.
061	09	9
062	01	1
063	85	+
064	43	RCL
065	01	01
066	85	+
067	43	RCL
068	02	02
069	85	+
070	43	RCL
071	03	03
072	75	-
073	43	RCL
074	04	04
075	95	=
076	91	R/S
077	81	RST

V21	V7	V9	V2L3	

V4--Dollar Value of NSN's on Hand

000	76	LBL
001	11	A
002	65	×
003	01	1
004	93	.
005	04	4
006	01	1
007	06	6
008	07	7
009	05	5
010	95	=
011	42	STO
012	01	01
013	91	R/S
014	76	LBL
015	12	B
016	65	×
017	93	.
018	01	1
019	01	1
020	01	1
021	09	9
022	06	6
023	05	5
024	95	=
025	42	STO
026	02	02
027	91	R/S
028	76	LBL
029	13	C
030	65	×
031	93	.
032	00	0
033	00	0
034	00	0
035	04	4
036	05	5
037	01	1
038	01	1
039	00	0
040	00	0
041	95	=
042	42	STO
043	03	03
044	91	R/S
045	02	2
046	93	.
047	08	8
048	06	6
049	07	7
050	02	2
051	07	7
052	94	+/-
053	85	+
054	43	RCL
055	01	01
056	85	+
057	43	RCL
058	02	02
059	85	+
060	43	RCL
061	03	03
062	95	=
063	91	R/S
064	81	RST

V22	V33	V18L2		

V5--Number of NSN's with an RO

000	76	LBL	041	14	D	082	91	R/S	123	95	=
001	11	A	042	65	×	083	76	LBL	124	44	SUM
002	65	×	043	01	1	084	17	B'	125	01	01
003	93	.	044	07	7	085	65	×	126	91	R/S
004	04	4	045	04	4	086	93	.	127	01	1
005	05	5	046	93	.	087	00	0	128	06	6
006	05	5	047	06	6	088	07	7	129	05	5
007	04	4	048	00	0	089	05	5	130	09	9
008	03	3	049	01	1	090	08	8	131	93	.
009	02	2	050	95	=	091	09	9	132	08	8
010	95	=	051	44	SUM	092	01	1	133	85	+
011	42	STO	052	01	01	093	95	=	134	43	RCL
012	01	01	053	91	R/S	094	44	SUM	135	01	01
013	91	R/S	054	76	LBL	095	01	01	136	95	=
014	76	LBL	055	15	E	096	91	R/S	137	91	R/S
015	12	B	056	65	×	097	76	LBL	138	81	RST
016	42	STO	057	06	6	098	18	C'			
017	02	02	058	93	.	099	65	×			
018	91	R/S	059	02	2	100	01	1			
019	76	LBL	060	04	4	101	02	2			
020	13	C	061	03	3	102	93	.			
021	42	STO	062	01	1	103	05	5			
022	03	03	063	02	2	104	01	1			
023	43	RCL	064	94	+/-	105	01	1			
024	02	02	065	95	=	106	01	1			
025	55	÷	066	44	SUM	107	95	=			
026	43	RCL	067	01	01	108	44	SUM			
027	03	03	068	91	R/S	109	01	01			
028	65	×	069	76	LBL	110	91	R/S			
029	01	1	070	16	A'	111	76	LBL			
030	06	6	071	65	×	112	19	D'			
031	02	2	072	01	1	113	65	×			
032	08	8	073	93	.	114	93	.			
033	04	4	074	00	0	115	00	0			
034	93	.	075	01	1	116	06	6			
035	06	6	076	08	8	117	09	9			
036	95	=	077	05	5	118	04	4			
037	44	SUM	078	01	1	119	00	0			
038	01	01	079	95	=	120	08	8			
039	91	R/S	080	44	SUM	121	08	8			
040	76	LBL	081	01	01	122	94	+/-			

V30	V25L3	V14L3	V3L1	
V5L1	V2L1	V31L2	V27	V13

V6--Dollar Value of NSN's with an RO

000	76	LBL
001	11	A
002	65	×
003	93	.
004	02	2
005	03	3
006	06	6
007	08	8
008	00	0
009	04	4
010	95	=
011	42	STO
012	01	01
013	91	R/S
014	76	LBL
015	12	B
016	65	×
017	93	.
018	00	0
019	08	8
020	06	6
021	05	5
022	05	5
023	05	5
024	09	9
025	94	+/-
026	95	=
027	42	STO
028	02	02
029	91	R/S
030	76	LBL
031	13	C
032	65	×
033	93	.
034	00	0
035	00	0
036	00	0
037	02	2
038	08	8
039	06	6
040	07	7
041	04	4
042	05	5
043	95	=
044	42	STO
045	03	03
046	91	R/S
047	76	LBL
048	14	D
049	65	×
050	93	.
051	00	0
052	04	4
053	06	6
054	08	8
055	05	5
056	02	2
057	00	0
058	94	+/-
059	95	=
060	42	STO
061	04	04
062	91	R/S
063	76	LBL
064	15	E
065	42	STO
066	05	05
067	91	R/S
068	76	LBL
069	16	A'
070	42	STO
071	06	06
072	43	RCL
073	05	05
074	55	÷
075	43	RCL
076	06	06
077	65	×
078	93	.
079	02	2
080	08	8
081	06	6
082	07	7
083	05	5
084	08	8
085	94	+/-
086	95	=
087	42	STO
088	05	05
089	91	R/S
090	76	LBL
091	17	B'
092	42	STO
093	06	06
094	91	R/S
095	76	LBL
096	18	C'
097	42	STO
098	07	07
099	43	RCL
100	06	06
101	55	÷
102	43	RCL
103	07	07
104	65	×
105	93	.
106	00	0
107	00	0
108	00	0
109	01	1
110	07	7
111	08	8
112	06	6
113	02	2
114	08	8
115	94	+/-
116	95	=
117	42	STO
118	06	06
119	91	R/S
120	01	1
121	00	0
122	93	.
123	03	3
124	09	9
125	03	3
126	04	4
127	85	+
128	43	RCL
129	01	01
130	85	+
131	43	RCL
132	02	02
133	85	+
134	43	RCL
135	03	03
136	85	+
137	43	RCL
138	04	04
139	85	+
140	43	RCL
141	05	05
142	85	+
143	43	RCL
144	06	06
145	95	=
146	91	R/S
147	81	RST
148	00	0
149	00	0
150	00	0

V12	V3	V4		
V6L1	V9	V7	V9L2	V11

V7--Number of RO NSN's on Hand

000	76	LBL	041	42	STO	082	95	=
001	11	A	042	03	03	083	42	STO
002	65	×	043	91	R/S	084	06	06
003	01	1	044	76	LBL	085	91	R/S
004	06	6	045	14	D	086	03	3
005	93	.	046	65	×	087	01	1
006	02	2	047	04	4	088	09	9
007	03	3	048	06	6	089	04	4
008	01	1	049	03	3	090	03	3
009	08	8	050	93	.	091	93	.
010	94	+/-	051	06	6	092	06	6
011	95	=	052	05	5	093	85	+
012	42	STO	053	95	=	094	43	RCL
013	01	01	054	42	STO	095	01	01
014	91	R/S	055	04	04	096	85	+
015	76	LBL	056	91	R/S	097	43	RCL
016	12	B	057	76	LBL	098	02	02
017	65	×	058	15	E	099	85	+
018	01	1	059	65	×	100	43	RCL
019	05	5	060	07	7	101	03	03
020	05	5	061	01	1	102	85	+
021	09	9	062	93	.	103	43	RCL
022	93	.	063	09	9	104	04	04
023	02	2	064	08	8	105	85	+
024	94	+/-	065	07	7	106	43	RCL
025	95	=	066	94	+/-	107	05	05
026	42	STO	067	95	=	108	85	+
027	02	02	068	42	STO	109	43	RCL
028	91	R/S	069	05	05	110	06	06
029	76	LBL	070	91	R/S	111	95	=
030	13	C	071	76	LBL	112	91	R/S
031	65	×	072	16	A'	113	81	RST
032	93	.	073	65	×			
033	09	9	074	01	1			
034	09	9	075	93	.			
035	00	0	076	01	1			
036	08	8	077	02	2			
037	07	7	078	01	1			
038	04	4	079	02	2			
039	94	+/-	080	04	4			
040	95	=	081	94	+/-			

V31L2				
V14	V24L3	V30L3	V24	V1

V8--Dollar Value of RO NSN's on Hand

000	76	LBL	041	95	=	082	00	0
001	11	A	042	42	STO	083	00	0
002	65	×	043	03	03	084	01	1
003	01	1	044	91	R/S	085	02	2
004	93	.	045	76	LBL	086	04	4
005	00	0	046	14	D	087	07	7
006	08	8	047	65	×	088	01	1
007	08	8	048	93	.	089	01	1
008	08	8	049	00	0	090	95	=
009	03	3	050	00	0	091	94	+/-
010	95	=	051	00	0	092	42	STO
011	42	STO	052	02	2	093	06	06
012	01	01	053	01	1	094	91	R/S
013	91	R/S	054	05	5	095	06	6
014	76	LBL	055	09	9	096	93	.
015	12	B	056	02	2	097	02	2
016	65	×	057	08	8	098	06	6
017	93	.	058	95	=	099	09	9
018	01	1	059	42	STO	100	04	4
019	05	5	060	04	04	101	02	2
020	08	8	061	91	R/S	102	94	+/-
021	00	0	062	76	LBL	103	85	+
022	05	5	063	15	E	104	43	RCL
023	05	5	064	65	×	105	01	01
024	95	=	065	93	.	106	85	+
025	42	STO	066	02	2	107	43	RCL
026	02	02	067	01	1	108	02	02
027	91	R/S	068	00	0	109	85	+
028	76	LBL	069	04	4	110	43	RCL
029	13	C	070	05	5	111	03	03
030	65	×	071	09	9	112	85	+
031	93	.	072	95	=	113	43	RCL
032	00	0	073	94	+/-	114	04	04
033	00	0	074	42	STO	115	85	+
034	00	0	075	05	05	116	43	RCL
035	05	5	076	91	R/S	117	05	05
036	06	6	077	76	LBL	118	85	+
037	02	2	078	16	A'	119	43	RCL
038	06	6	079	65	×	120	06	06
039	06	6	080	93	.	121	95	=
040	04	4	081	00	0	122	91	R/S
						123	81	RST

V30L2				
V22	V33	V18L2	V28L2	V24L2

V9--Percent Availability of RO NSN's on Hand

000	76	LBL
001	11	A
002	65	×
003	93	.
004	00	0
005	00	0
006	02	2
007	03	3
008	00	0
009	05	5
010	01	1
011	02	2
012	95	=
013	42	STO
014	01	01
015	91	R/S
016	76	LBL
017	12	B
018	65	×
019	93	.
020	00	0
021	00	0
022	01	1
023	03	3
024	06	6
025	07	7
026	06	6
027	03	3
028	95	=
029	42	STO
030	02	02
031	91	R/S
032	76	LBL
033	13	C
034	65	×
035	93	.
036	00	0
037	00	0
038	01	1
039	00	0
040	09	9
041	00	0
042	07	7
043	01	1
044	95	=
045	42	STO
046	03	03
047	91	R/S
048	76	LBL
049	14	D
050	65	×
051	93	.
052	03	3
053	09	9
054	02	2
055	06	6
056	02	2
057	04	4
058	95	=
059	94	+/-
060	42	STO
061	04	04
062	91	R/S
063	76	LBL
064	15	E
065	65	×
066	93	.
067	04	4
068	05	5
069	04	4
070	07	7
071	00	0
072	04	4
073	95	=
074	94	+/-
075	42	STO
076	05	05
077	91	R/S
078	76	LBL
079	16	A'
080	65	×
081	93	.
082	00	0
083	00	0
084	03	3
085	05	5
086	07	7
087	09	9
088	07	7
089	08	8
090	95	=
091	94	+/-
092	42	STO
093	06	06
094	91	R/S
095	01	1
096	00	0
097	05	5
098	93	.
099	06	6
100	02	2
101	08	8
102	85	+
103	43	RCL
104	01	01
105	85	+
106	43	RCL
107	02	02
108	85	+
109	43	RCL
110	03	03
111	85	+
112	43	RCL
113	04	04
114	85	+
115	43	RCL
116	05	05
117	85	+
118	43	RCL
119	06	06
120	95	=
121	91	R/S
122	81	RST

V31L1				
V18L3	V11L1	V11L2	V1L3	V2L2

V10--Receipts from Due

000	76	LBL	041	42	STO	082	09	9	123	85	+
001	11	A	042	03	03	083	04	4	124	43	RCL
002	65	×	043	91	R/S	084	95	=	125	05	05
003	93	.	044	76	LBL	085	94	+/-	126	85	+
004	07	7	045	14	D	086	42	STO	127	43	RCL
005	02	2	046	65	×	087	06	06	128	06	06
006	03	3	047	04	4	088	91	R/S	129	85	+
007	02	2	048	06	6	089	76	LBL	130	43	RCL
008	06	6	049	02	2	090	17	B'	131	07	07
009	01	1	050	93	.	091	65	×	132	95	=
010	95	=	051	08	8	092	04	4	133	91	R/S
011	42	STO	052	05	5	093	05	5	134	81	RST
012	01	01	053	05	5	094	08	8			
013	91	R/S	054	95	=	095	93	.			
014	76	LBL	055	42	STO	096	00	0			
015	12	B	056	04	04	097	09	9			
016	65	×	057	91	R/S	098	09	9			
017	02	2	058	76	LBL	099	95	=			
018	07	7	059	15	E	100	94	+/-			
019	05	5	060	65	×	101	42	STO			
020	93	.	061	02	2	102	07	07			
021	09	9	062	01	1	103	91	R/S			
022	00	0	063	93	.	104	03	3			
023	04	4	064	00	0	105	03	3			
024	95	=	065	07	7	106	06	6			
025	94	+/-	066	09	9	107	01	1			
026	42	STO	067	03	3	108	09	9			
027	02	02	068	95	=	109	93	.			
028	91	R/S	069	94	+/-	110	03	3			
029	76	LBL	070	42	STO	111	85	+			
030	13	C	071	05	05	112	43	RCL			
031	65	×	072	91	R/S	113	01	01			
032	04	4	073	76	LBL	114	85	+			
033	06	6	074	16	A'	115	43	RCL			
034	07	7	075	65	×	116	02	02			
035	93	.	076	93	.	117	85	+			
036	03	3	077	00	0	118	43	RCL			
037	00	0	078	02	2	119	03	03			
038	09	9	079	08	8	120	85	+			
039	95	=	080	09	9	121	43	RCL			
040	94	+/-	081	00	0	122	04	04			

V19L2	V24L2			
V11L1	V9L3	V2L1	V1L1	V14L2

V11--Number of NSN's with Dues

000	76	LBL
001	11	A
002	65	×
003	03	3
004	93	.
005	00	0
006	08	8
007	09	9
008	01	1
009	95	=
010	42	STO
011	01	01
012	91	R/S
013	76	LBL
014	12	B
015	65	×
016	93	.
017	02	2
018	09	9
019	03	3
020	03	3
021	00	0
022	05	5
023	95	=
024	94	+/-
025	42	STO
026	02	02
027	91	R/S
028	76	LBL
029	13	C
030	65	×
031	03	3
032	93	.
033	04	4
034	06	6
035	06	6
036	09	9
037	02	2
038	95	=
039	94	+/-
040	42	STO
041	03	03
042	91	R/S
043	76	LBL
044	14	D
045	65	×
046	01	1
047	93	.
048	03	3
049	05	5
050	06	6
051	01	1
052	07	7
053	95	=
054	42	STO
055	04	04
056	91	R/S
057	76	LBL
058	15	E
059	65	×
060	93	.
061	01	1
062	01	1
063	02	2
064	08	8
065	02	2
066	04	4
067	95	=
068	42	STO
069	05	05
070	91	R/S
071	76	LBL
072	16	A'
073	65	×
074	93	.
075	08	8
076	00	0
077	06	6
078	01	1
079	08	8
080	02	2
081	95	=
082	42	STO
083	06	06
084	91	R/S
085	76	LBL
086	17	B'
087	65	×
088	93	.
089	02	2
090	03	3
091	05	5
092	08	8
093	09	9
094	05	5
095	95	=
096	42	STO
097	07	07
098	91	R/S
099	03	3
100	00	0
101	00	0
102	05	5
103	93	.
104	00	0
105	02	2
106	85	+
107	43	RCL
108	01	01
109	85	+
110	43	RCL
111	02	02
112	85	+
113	43	RCL
114	03	03
115	85	+
116	43	RCL
117	04	04
118	85	+
119	43	RCL
120	05	05
121	85	+
122	43	RCL
123	06	06
124	85	+
125	43	RCL
126	07	07
127	95	=
128	91	R/S
129	81	RST

V30L1	V10L3			
V30	V21	V13L2	V30L3	V15L2

V12--Dollar Value of NSN's with Dues

000	76	LBL
001	11	A
002	65	×
003	01	1
004	93	.
005	00	0
006	06	6
007	03	3
008	00	0
009	06	6
010	95	=
011	42	STO
012	01	01
013	91	R/S
014	76	LBL
015	12	B
016	65	×
017	93	.
018	08	8
019	07	7
020	03	3
021	08	8
022	03	3
023	03	3
024	95	=
025	42	STO
026	02	02
027	91	R/S
028	76	LBL
029	13	C
030	65	×
031	93	.
032	00	0
033	09	9
034	07	7
035	01	1
036	06	6
037	06	6
038	06	6
039	95	=
040	94	+/-
041	42	STO
042	03	03
043	91	R/S
044	76	LBL
045	14	D
046	65	×
047	06	6
048	06	6
049	93	.
050	06	6
051	02	2
052	07	7
053	07	7
054	95	=
055	42	STO
056	04	04
057	91	R/S
058	76	LBL
059	15	E
060	65	×
061	93	.
062	00	0
063	05	5
064	08	8
065	06	6
066	02	2
067	07	7
068	08	8
069	95	=
070	42	STO
071	05	05
072	91	R/S
073	76	LBL
074	16	A'
075	42	STO
076	06	06
077	91	R/S
078	76	LBL
079	17	B'
080	42	STO
081	07	07
082	43	RCL
083	06	06
084	55	÷
085	43	RCL
086	07	07
087	65	×
088	93	.
089	03	3
090	05	5
091	03	3
092	08	8
093	02	2
094	08	8
095	95	=
096	94	+/-
097	42	STO
098	06	06
099	91	R/S
100	05	5
101	04	4
102	01	1
103	05	5
104	93	.
105	07	7
106	09	9
107	94	+/-
108	85	+
109	43	RCL
110	01	01
111	85	+
112	43	RCL
113	02	02
114	85	+
115	43	RCL
116	03	03
117	85	+
118	43	RCL
119	04	04
120	85	+
121	43	RCL
122	05	05
123	85	+
124	43	RCL
125	06	06
126	95	=
127	91	R/S
128	81	RST

V5	V6			
V30	V12L1	V10	V9L3	V15L3

V13--Number of NSN's with Excess Dues over Req + RO

000	76	LBL	041	95	=	082	85	+
001	11	A	042	42	STO	083	43	RCL
002	65	×	043	03	03	084	01	01
003	93	.	044	91	R/S	085	85	+
004	00	0	045	76	LBL	086	43	RCL
005	06	6	046	14	D	087	02	02
006	01	1	047	65	×	088	85	+
007	01	1	048	93	.	089	43	RCL
008	07	7	049	00	0	090	03	03
009	02	2	050	02	2	091	85	+
010	05	5	051	01	1	092	43	RCL
011	95	=	052	06	6	093	04	04
012	42	STO	053	08	8	094	85	+
013	01	01	054	04	4	095	43	RCL
014	91	R/S	055	01	1	096	05	05
015	76	LBL	056	95	=	097	95	=
016	12	B	057	94	+/-	098	91	R/S
017	65	×	058	42	STO	099	81	RST
018	01	1	059	04	04			
019	03	3	060	91	R/S			
020	93	.	061	76	LBL			
021	04	4	062	15	E			
022	06	6	063	65	×			
023	08	8	064	01	1			
024	05	5	065	93	.			
025	95	=	066	01	1			
026	94	+/-	067	04	4			
027	42	STO	068	04	4			
028	02	02	069	06	6			
029	91	R/S	070	06	6			
030	76	LBL	071	95	=			
031	13	C	072	42	STO			
032	65	×	073	05	05			
033	93	.	074	91	R/S			
034	00	0	075	05	5			
035	04	4	076	01	1			
036	09	9	077	01	1			
037	09	9	078	93	.			
038	00	0	079	03	3			
039	01	1	080	08	8			
040	09	9	081	08	8			

V11	V17L1	V7L2	V5	V14L2

V14--Dollar Value of Excess Dues Over REQ + ERQ

000	76	LBL	041	75	-
001	11	A	042	43	RCL
002	65	×	043	04	04
003	05	5	044	95	=
004	93	.	045	65	×
005	00	0	046	08	8
006	02	2	047	93	.
007	01	1	048	01	1
008	04	4	049	05	5
009	09	9	050	05	5
010	94	+/-	051	01	1
011	95	=	052	02	2
012	42	STO	053	95	=
013	01	01	054	42	STO
014	91	R/S	055	03	03
015	76	LBL	056	91	R/S
016	12	B	057	07	7
017	65	×	058	00	0
018	93	.	059	06	6
019	00	0	060	93	.
020	01	1	061	03	3
021	04	4	062	09	9
022	05	5	063	85	+
023	09	9	064	43	RCL
024	02	2	065	01	01
025	94	+/-	066	85	+
026	95	=	067	43	RCL
027	42	STO	068	02	02
028	02	02	069	85	+
029	91	R/S	070	43	RCL
030	76	LBL	071	03	03
031	13	C	072	95	=
032	42	STO	073	91	R/S
033	03	03	074	81	RST
034	91	R/S			
035	76	LBL			
036	14	D			
037	42	STO			
038	04	04			
039	43	RCL			
040	03	03			

V2	V7	V2L3	V1L3	

V15--Total Demands

000	76	LBL
001	11	A
002	65	×
003	01	1
004	93	.
005	00	0
006	02	2
007	04	4
008	08	8
009	06	6
010	95	=
011	42	STO
012	01	01
013	91	R/S
014	76	LBL
015	12	B
016	65	×
017	93	.
018	03	3
019	02	2
020	06	6
021	03	3
022	03	3
023	03	3
024	08	8
025	95	=
026	42	STO
027	02	02
028	91	R/S
029	76	LBL
030	13	C
031	65	×
032	93	.
033	04	4
034	07	7
035	08	8
036	05	5
037	01	1
038	05	5
039	95	=
040	42	STO
041	03	03
042	91	R/S
043	76	LBL
044	14	D
045	65	×
046	93	.
047	04	4
048	07	7
049	09	9
050	02	2
051	09	9
052	03	3
053	95	=
054	42	STO
055	04	04
056	91	R/S
057	76	LBL
058	15	E
059	65	×
060	07	7
061	09	9
062	08	8
063	93	.
064	04	4
065	95	=
066	42	STO
067	05	05
068	91	R/S
069	06	6
070	00	0
071	07	7
072	93	.
073	06	6
074	06	6
075	01	1
076	94	+/-
077	85	+
078	43	RCL
079	01	01
080	85	+
081	43	RCL
082	02	02
083	75	-
084	43	RCL
085	03	03
086	85	+
087	43	RCL
088	04	04
089	85	+
090	43	RCL
091	05	05
092	95	=
093	91	R/S
094	81	RST

V16	V16L3	V11L1	V10L3	V24

V16--RO Demands

000	76	LBL	041	95	=	082	00	0	123	04	4
001	11	A	042	42	STO	083	05	5	124	08	8
002	65	×	043	03	03	084	94	+/-	125	01	1
003	02	2	044	91	R/S	085	95	=	126	95	=
004	93	.	045	76	LBL	086	42	STO	127	42	STO
005	02	2	046	14	D	087	06	06	128	09	09
006	00	0	047	65	×	088	91	R/S	129	91	R/S
007	07	7	048	93	.	089	76	LBL	130	01	1
008	05	5	049	05	5	090	17	B'	131	04	4
009	07	7	050	04	4	091	42	STO	132	03	3
010	94	+/-	051	02	2	092	07	07	133	08	8
011	95	=	052	00	0	093	91	R/S	134	05	5
012	42	STO	053	09	9	094	76	LBL	135	07	7
013	01	01	054	09	9	095	18	C'	136	85	+
014	91	R/S	055	94	+/-	096	42	STO	137	43	RCL
015	76	LBL	056	95	=	097	08	08	138	01	01
016	12	B	057	42	STO	098	43	RCL	139	85	+
017	65	×	058	04	04	099	07	07	140	43	RCL
018	05	5	059	91	R/S	100	65	×	141	02	02
019	07	7	060	76	LBL	101	01	1	142	85	+
020	08	8	061	15	E	102	07	7	143	43	RCL
021	93	.	062	65	×	103	01	1	144	03	03
022	00	0	063	93	.	104	04	4	145	85	+
023	08	8	064	07	7	105	93	.	146	43	RCL
024	08	8	065	08	8	106	02	2	147	04	04
025	94	+/-	066	05	5	107	09	9	148	85	+
026	95	=	067	00	0	108	94	+/-	149	43	RCL
027	42	STO	068	07	7	109	55	÷	150	05	05
028	02	02	069	06	6	110	43	RCL	151	85	+
029	91	R/S	070	95	=	111	08	08	152	43	RCL
030	76	LBL	071	42	STO	112	95	=	153	06	06
031	13	C	072	05	05	113	42	STO	154	85	+
032	65	×	073	91	R/S	114	08	08	155	43	RCL
033	01	1	074	76	LBL	115	91	R/S	156	08	08
034	00	0	075	16	A'	116	76	LBL	157	85	+
035	93	.	076	65	×	117	19	D'	158	43	RCL
036	07	7	077	03	3	118	65	×	159	09	09
037	06	6	078	93	.	119	93	.	160	95	=
038	03	3	079	08	8	120	01	1	161	91	R/S
039	04	4	080	05	5	121	06	6	162	81	RST
040	94	+/-	081	07	7	122	07	7			

V23L1	V11	V12	V25L1	
V23	V27	V13L1	V16L2	V5L1

V17--Percent Demands for RO Items

000	76	LBL
001	11	A
002	65	×
003	93	.
004	09	9
005	01	1
006	02	2
007	04	4
008	05	5
009	02	2
010	95	=
011	42	STO
012	01	01
013	91	R/S
014	76	LBL
015	12	B
016	65	×
017	93	.
018	09	9
019	09	9
020	04	4
021	00	0
022	04	4
023	09	9
024	94	+/-
025	95	=
026	42	STO
027	02	02
028	91	R/S
029	76	LBL
030	13	C
031	65	×
032	93	.
033	00	0
034	00	0
035	01	1
036	04	4
037	07	7
038	05	5
039	09	9
040	05	5
041	94	+/-
042	95	=
043	42	STO
044	03	03
045	91	R/S
046	76	LBL
047	14	D
048	65	×
049	93	.
050	05	5
051	07	7
052	08	8
053	01	1
054	05	5
055	04	4
056	94	+/-
057	95	=
058	42	STO
059	04	04
060	91	R/S
061	76	LBL
062	15	E
063	65	×
064	93	.
065	00	0
066	00	0
067	02	2
068	01	1
069	06	6
070	07	7
071	03	3
072	09	9
073	95	=
074	42	STO
075	05	05
076	91	R/S
077	76	LBL
078	16	A'
079	65	×
080	93	.
081	00	0
082	00	0
083	03	3
084	06	6
085	00	0
086	01	1
087	09	9
088	01	1
089	94	+/-
090	95	=
091	42	STO
092	06	06
093	91	R/S
094	01	1
095	03	3
096	09	9
097	93	.
098	09	9
099	05	5
100	03	3
101	85	+
102	43	RCL
103	01	01
104	85	+
105	43	RCL
106	02	02
107	85	+
108	43	RCL
109	03	03
110	85	+
111	43	RCL
112	04	04
113	85	+
114	43	RCL
115	05	05
116	85	+
117	43	RCL
118	06	06
119	95	=
120	91	R/S
121	81	RST

V31L3				
V1	V2	V10L3	V27	V12L2

V18--Number of Backorders

000	76	LBL	041	91	R/S	082	01	01
001	11	A	042	76	LBL	083	91	R/S
002	65	×	043	14	D	084	76	LBL
003	02	2	044	42	STO	085	17	B'
004	02	2	045	02	02	086	65	×
005	03	3	046	91	R/S	087	02	2
006	93	.	047	76	LBL	088	09	9
007	01	1	048	15	E	089	00	0
008	04	4	049	42	STO	090	93	.
009	08	8	050	03	03	091	01	1
010	94	+/-	051	43	RCL	092	07	7
011	95	=	052	02	02	093	08	8
012	42	STO	053	55	÷	094	94	+/-
013	01	01	054	43	RCL	095	95	=
014	91	R/S	055	03	03	096	44	SUM
015	76	LBL	056	95	=	097	01	01
016	12	B	057	65	×	098	91	R/S
017	42	STO	058	07	7	099	02	2
018	02	02	059	06	6	100	04	4
019	91	R/S	060	08	8	101	08	8
020	76	LBL	061	93	.	102	03	3
021	13	C	062	06	6	103	09	9
022	42	STO	063	01	1	104	93	.
023	03	03	064	04	4	105	08	8
024	43	RCL	065	95	=	106	85	+
025	02	02	066	44	SUM	107	43	RCL
026	55	÷	067	01	01	108	01	01
027	43	RCL	068	91	R/S	109	95	=
028	03	03	069	76	LBL	110	91	R/S
029	95	=	070	16	A'	111	81	RST
030	65	×	071	65	×			
031	01	1	072	93	.			
032	00	0	073	01	1			
033	93	.	074	05	5			
034	00	0	075	03	3			
035	00	0	076	03	3			
036	05	5	077	04	4			
037	06	6	078	05	5			
038	95	=	079	94	+/-			
039	44	SUM	080	95	=			
040	01	01	081	44	SUM			

V11L3	V22			
V27L1	V15	V30L2	V2L1	V30

V19--Number of NSN's with RO REQ Not on Order

000	76	LBL
001	11	A
002	65	×
003	01	1
004	93	.
005	01	1
006	00	0
007	05	5
008	03	3
009	06	6
010	94	+/-
011	95	=
012	42	STO
013	01	01
014	91	R/S
015	76	LBL
016	12	B
017	42	STO
018	02	02
019	91	R/S
020	76	LBL
021	13	C
022	42	STO
023	03	03
024	43	RCL
025	02	02
026	85	+
027	43	RCL
028	03	03
029	95	=
030	65	×
031	01	1
032	93	.
033	00	0
034	09	9
035	05	5
036	09	9
037	03	3
038	94	+/-
039	95	=
040	44	SUM
041	01	01
042	91	R/S
043	76	LBL
044	14	D
045	42	STO
046	02	02
047	91	R/S
048	76	LBL
049	15	E
050	42	STO
051	03	03
052	43	RCL
053	02	02
054	55	÷
055	43	RCL
056	03	03
057	95	=
058	65	×
059	04	4
060	93	.
061	01	1
062	05	5
063	01	1
064	02	2
065	04	4
066	94	+/-
067	95	=
068	44	SUM
069	01	01
070	91	R/S
071	03	3
072	06	6
073	00	0
074	03	3
075	05	5
076	93	.
077	02	2
078	85	+
079	43	RCL
080	01	01
081	95	=
082	91	R/S
083	81	RST

V29L2	V30	V31	V5	V6

V20--Dollar Value of NSN's with REQ But Not on Order

000	76	LBL	041	42	STO	082	43	RCL
001	11	A	042	03	03	083	01	01
002	65	×	043	91	R/S	084	85	+
003	93	.	044	76	LBL	085	43	RCL
004	01	1	045	14	D	086	02	02
005	01	1	046	65	×	087	85	+
006	02	2	047	93	.	088	43	RCL
007	09	9	048	00	0	089	03	03
008	00	0	049	04	4	090	85	+
009	06	6	050	08	8	091	43	RCL
010	95	=	051	06	6	092	04	04
011	42	STO	052	02	2	093	85	+
012	01	01	053	08	8	094	43	RCL
013	91	R/S	054	05	5	095	05	05
014	76	LBL	055	95	=	096	95	=
015	12	B	056	42	STO	097	91	R/S
016	65	×	057	04	04	098	81	RST
017	93	.	058	91	R/S			
018	00	0	059	76	LBL			
019	03	3	060	15	E			
020	07	7	061	65	×			
021	04	4	062	02	2			
022	05	5	063	03	3			
023	01	1	064	93	.			
024	03	3	065	00	0			
025	95	=	066	06	6			
026	42	STO	067	09	9			
027	02	02	068	03	3			
028	91	R/S	069	94	+/-			
029	76	LBL	070	95	=			
030	13	C	071	42	STO			
031	65	×	072	05	05			
032	93	.	073	91	R/S			
033	01	1	074	03	3			
034	02	2	075	05	5			
035	08	8	076	02	2			
036	07	7	077	93	.			
037	05	5	078	02	2			
038	07	7	079	09	9			
039	94	+/-	080	03	3			
040	95	=	081	85	+			

V19	V25L2	V30	V25L3	V26L3

V21--Number of NSN's on Hand Over RO + ERQ

000	76	LBL	041	03	03	082	95	=	123	85	+
001	11	A	042	91	R/S	083	42	STO	124	43	RCL
002	65	×	043	76	LBL	084	06	06	125	06	06
003	02	2	044	14	D	085	91	R/S	126	85	+
004	06	6	045	65	×	086	76	LBL	127	43	RCL
005	03	3	046	02	2	087	17	B'	128	07	07
006	93	.	047	08	8	088	65	×	129	95	=
007	07	7	048	08	8	089	93	.	130	91	R/S
008	07	7	049	93	.	090	00	0	131	81	RST
009	03	3	050	00	0	091	07	7			
010	94	+/-	051	09	9	092	04	4			
011	95	=	052	01	1	093	06	6			
012	42	STO	053	95	=	094	06	6			
013	01	01	054	42	STO	095	09	9			
014	91	R/S	055	04	04	096	03	3			
015	76	LBL	056	91	R/S	097	95	=			
016	12	B	057	76	LBL	098	42	STO			
017	65	×	058	15	E	099	07	07			
018	93	.	059	65	×	100	91	R/S			
019	03	3	060	93	.	101	01	1			
020	05	5	061	02	2	102	07	7			
021	06	6	062	03	3	103	05	5			
022	04	4	063	01	1	104	02	2			
023	08	8	064	01	1	105	08	8			
024	03	3	065	08	8	106	93	.			
025	95	=	066	08	8	107	09	9			
026	42	STO	067	95	=	108	85	+			
027	02	02	068	42	STO	109	43	RCL			
028	91	R/S	069	05	05	110	01	01			
029	76	LBL	070	91	R/S	111	85	+			
030	13	C	071	76	LBL	112	43	RCL			
031	65	×	072	16	A'	113	02	02			
032	02	2	073	65	×	114	85	+			
033	04	4	074	93	.	115	43	RCL			
034	06	6	075	02	2	116	03	03			
035	93	.	076	07	7	117	85	+			
036	04	4	077	03	3	118	43	RCL			
037	05	5	078	08	8	119	04	04			
038	08	8	079	00	0	120	85	+			
039	95	=	080	07	7	121	43	RCL			
040	42	STO	081	94	+/-	122	05	05			

V31L2	V18L1			
V26	V3	V14L1	V6	V30L2

V22--Dollar Value of NSN's on Hand Over RO + ERQ

000	76	LBL
001	11	A
002	65	×
003	93	.
004	00	0
005	00	0
006	00	0
007	01	1
008	08	8
009	08	8
010	00	0
011	05	5
012	01	1
013	95	=
014	42	STO
015	01	01
016	91	R/S
017	76	LBL
018	12	B
019	42	STO
020	02	02
021	91	R/S
022	76	LBL
023	13	C
024	42	STO
025	03	03
026	43	RCL
027	02	02
028	55	÷
029	43	RCL
030	03	03
031	95	=
032	65	×
033	93	.
034	00	0
035	00	0
036	00	0
037	05	5
038	09	9
039	09	9
040	02	2

041	09	9
042	94	+/-
043	95	=
044	42	STO
045	02	02
046	91	R/S
047	76	LBL
048	14	D
049	65	×
050	93	.
051	00	0
052	00	0
053	00	0
054	01	1
055	01	1
056	01	1
057	03	3
058	08	8
059	08	8
060	95	=
061	42	STO
062	03	03
063	91	R/S
064	76	LBL
065	15	E
066	42	STO
067	04	04
068	91	R/S
069	76	LBL
070	16	A'
071	42	STO
072	05	05
073	85	+
074	43	RCL
075	04	04
076	95	=
077	65	×
078	93	.
079	00	0
080	00	0
081	00	0

082	02	2
083	04	4
084	07	7
085	06	6
086	00	0
087	01	1
088	95	=
089	42	STO
090	04	04
091	91	R/S
092	76	LBL
093	17	B'
094	65	×
095	93	.
096	00	0
097	02	2
098	01	1
099	06	6
100	07	7
101	07	7
102	01	1
103	95	=
104	42	STO
105	05	05
106	91	R/S
107	76	LBL
108	18	C'
109	65	×
110	93	.
111	00	0
112	00	0
113	03	3
114	07	7
115	09	9
116	08	8
117	09	9
118	94	+/-
119	95	=
120	42	STO
121	06	06
122	91	R/S

123	76	LBL
124	19	D'
125	65	×
126	93	.
127	00	0
128	00	0
129	00	0
130	00	0
131	02	2
132	08	8
133	08	8
134	08	8
135	07	7
136	02	2
137	95	=
138	42	STO
139	07	07
140	91	R/S
141	93	.
142	04	4
143	06	6
144	07	7
145	06	6
146	00	0
147	08	8
148	94	+/-
149	85	+
150	43	RCL
151	01	01
152	85	+
153	43	RCL
154	02	02
155	85	+
156	43	RCL
157	03	03
158	85	+
159	43	RCL
160	04	04
161	85	+
162	43	RCL
163	05	05
164	85	+
165	43	RCL
166	06	06
167	85	+
168	43	RCL

V31	V9L1	V14L2	V3L1	
V21	V3	V22	V18L1	V2L2

V22--Dollar Value of NSN's on Hand Over RO + ERQ (Continued)

169 07 07 170 95 = 171 91 R/S 172 81 RST			

V23--Number of NSN's with 30 Day Usage

000	76	LBL	041	76	LBL	082	42	STO	123	09	9
001	11	A	042	14	D	083	05	05	124	94	+/-
002	65	×	043	65	×	084	91	R/S	125	95	=
003	93	.	044	93	.	085	76	LBL	126	42	STO
004	05	5	045	01	1	086	17	B'	127	08	08
005	04	4	046	02	2	087	65	×	128	91	R/S
006	08	8	047	09	9	088	93	.	129	03	3
007	05	5	048	03	3	089	00	0	130	01	1
008	08	8	049	08	8	090	06	6	131	08	8
009	07	7	050	09	9	091	06	6	132	06	6
010	95	=	051	94	+/-	092	08	8	133	93	.
011	42	STO	052	95	=	093	08	8	134	06	6
012	01	01	053	42	STO	094	02	2	135	04	4
013	91	R/S	054	03	03	095	08	8	136	85	+
014	76	LBL	055	91	R/S	096	95	=	137	43	RCL
015	12	B	056	76	LBL	097	42	STO	138	01	01
016	42	STO	057	15	E	098	06	06	139	85	+
017	02	02	058	65	×	099	91	R/S	140	43	RCL
018	91	R/S	059	02	2	100	76	LBL	141	02	02
019	76	LBL	060	02	2	101	18	C'	142	85	+
020	13	C	061	93	.	102	65	×	143	43	RCL
021	42	STO	062	01	1	103	93	.	144	03	03
022	03	03	063	05	5	104	03	3	145	85	+
023	43	RCL	064	04	4	105	07	7	146	43	RCL
024	02	02	065	05	5	106	06	6	147	04	04
025	55	÷	066	95	=	107	07	7	148	85	+
026	43	RCL	067	42	STO	108	01	1	149	43	RCL
027	03	03	068	04	04	109	94	+/-	150	05	05
028	95	=	069	91	R/S	110	95	=	151	85	+
029	65	×	070	76	LBL	111	42	STO	152	43	RCL
030	93	.	071	16	A'	112	07	07	153	06	06
031	02	2	072	65	×	113	91	R/S	154	85	+
032	01	1	073	93	.	114	76	LBL	155	43	RCL
033	00	0	074	03	3	115	19	D'	156	07	07
034	09	9	075	01	1	116	65	×	157	85	+
035	01	1	076	00	0	117	93	.	158	43	RCL
036	08	8	077	03	3	118	02	2	159	08	08
037	95	=	078	02	2	119	03	3	160	95	=
038	42	STO	079	07	7	120	02	2	161	91	R/S
039	02	02	080	94	+/-	121	02	2	162	81	RST
040	91	R/S	081	95	=	122	07	7			

V31L3	V5L3	V31L2	V31L1	
V23L1	V21	V22	V18L1	V2L2

V24--Dollar Value of NSN's with 30 Day Usage

000	76	LBL
001	11	A
002	42	STO
003	01	01
004	91	R/S
005	76	LBL
006	12	B
007	42	STO
008	02	02
009	43	RCL
010	01	01
011	75	-
012	43	RCL
013	02	02
014	95	=
015	65	×
016	93	.
017	00	0
018	00	0
019	00	0
020	02	2
021	02	2
022	05	5
023	07	7
024	05	5
025	06	6
026	95	=
027	42	STO
028	01	01
029	91	R/S
030	76	LBL
031	13	C
032	65	×
033	93	.
034	00	0
035	00	0
036	00	0
037	02	2
038	02	2
039	06	6
040	01	1
041	05	5
042	05	5
043	94	+/-
044	95	=
045	42	STO
046	02	02
047	91	R/S
048	76	LBL
049	14	D
050	65	×
051	93	.
052	00	0
053	01	1
054	02	2
055	02	2
056	08	8
057	00	0
058	07	7
059	95	=
060	42	STO
061	03	03
062	91	R/S
063	76	LBL
064	15	E
065	65	×
066	93	.
067	04	4
068	00	0
069	09	9
070	07	7
071	04	4
072	07	7
073	95	=
074	42	STO
075	04	04
076	91	R/S
077	76	LBL
078	16	A'
079	65	×
080	93	.
081	00	0
082	00	0
083	00	0
084	03	3
085	00	0
086	06	6
087	07	7
088	01	1
089	07	7
090	95	=
091	42	STO
092	05	05
093	91	R/S
094	76	LBL
095	17	B'
096	65	×
097	93	.
098	00	0
099	00	0
100	00	0
101	00	0
102	04	4
103	01	1
104	03	3
105	05	5
106	01	1
107	02	2
108	94	+/-
109	95	=
110	42	STO
111	06	06
112	91	R/S
113	76	LBL
114	18	C'
115	65	×
116	93	.
117	02	2
118	07	7
119	04	4
120	03	3
121	09	9
122	06	6
123	94	+/-
124	95	=
125	42	STO
126	07	07
127	91	R/S
128	76	LBL
129	19	D'
130	65	×
131	93	.
132	00	0
133	00	0
134	00	0
135	01	1
136	00	0
137	00	0
138	03	3
139	06	6
140	03	3
141	94	+/-
142	95	=
143	42	STO
144	08	08
145	91	R/S
146	01	1
147	93	.
148	03	3
149	04	4
150	04	4
151	08	8
152	03	3
153	85	+
154	43	RCL
155	01	01
156	85	+
157	43	RCL
158	02	02
159	85	+
160	43	RCL
161	03	03
162	85	+
163	43	RCL
164	04	04
165	85	+
166	43	RCL
167	05	05
168	85	+

V28L1	V16L2	V6L1	V18	
V30L1	V31L1	V11L2	V14L2	V6L2

V24--Dollar Value of NSN'S with 30 Day Usage (continued)

169	43	RCL
170	06	06
171	85	+
172	43	RCL
173	07	07
174	85	−
175	43	RCL
176	08	08
177	95	=
178	91	R/S
179	81	RST

V25--Warehouse Issue Confirms

000	76	LBL	041	91	R/S	082	95	=
001	11	A	042	76	LBL	083	44	SUM
002	65	×	043	14	D	084	01	01
003	93	.	044	65	×	085	91	R/S
004	04	4	045	01	1	086	01	1
005	03	3	046	01	1	087	07	7
006	01	1	047	93	.	088	06	6
007	05	5	048	05	5	089	02	2
008	00	0	049	09	9	090	05	5
009	01	1	050	00	0	091	93	.
010	95	=	051	01	1	092	01	1
011	42	STO	052	94	+/-	093	94	+/-
012	01	01	053	95	=	094	85	+
013	91	R/S	054	44	SUM	095	43	RCL
014	76	LBL	055	01	01	096	01	01
015	12	B	056	91	R/S	097	95	=
016	65	×	057	76	LBL	098	91	R/S
017	01	1	058	15	E	099	81	RST
018	93	.	059	65	×			
019	09	9	060	01	1			
020	00	0	061	93	.			
021	02	2	062	00	0			
022	01	1	063	07	7			
023	09	9	064	05	5			
024	95	=	065	05	5			
025	44	SUM	066	08	8			
026	01	01	067	95	=			
027	91	R/S	068	44	SUM			
028	76	LBL	069	01	01			
029	13	C	070	91	R/S			
030	65	×	071	76	LBL			
031	03	3	072	16	A'			
032	07	7	073	65	×			
033	06	6	074	93	.			
034	93	.	075	04	4			
035	00	0	076	07	7			
036	03	3	077	00	0			
037	04	4	078	05	5			
038	95	=	079	00	0			
039	44	SUM	080	01	1			
040	01	01	081	94	+/-			

V5				
V16L3	V18	V27	V13L1	V18L3

V26--Percent Total NSN's on Hand Which Have an RO

000	76	LBL	041	07	7	082	00	0
001	11	A	042	06	6	083	00	0
002	65	×	043	95	=	084	00	0
003	93	.	044	42	STO	085	05	5
004	00	0	045	03	03	086	04	4
005	00	0	046	91	R/S	087	07	7
006	02	2	047	76	LBL	088	03	3
007	03	3	048	14	D	089	01	1
008	04	4	049	65	×	090	06	6
009	08	8	050	93	.	091	94	+/-
010	02	2	051	00	0	092	95	=
011	02	2	052	08	8	093	42	STO
012	94	+/-	053	05	5	094	06	06
013	95	=	054	02	2	095	91	R/S
014	42	STO	055	06	6	096	06	6
015	01	01	056	02	2	097	07	7
016	91	R/S	057	95	=	098	93	.
017	76	LBL	058	42	STO	099	05	5
018	12	B	059	04	04	100	00	0
019	65	×	060	91	R/S	101	05	5
020	93	.	061	76	LBL	102	85	+
021	00	0	062	15	E	103	43	RCL
022	00	0	063	65	×	104	01	01
023	01	1	064	93	.	105	85	+
024	03	3	065	00	0	106	43	RCL
025	00	0	066	00	0	107	02	02
026	00	0	067	00	0	108	85	+
027	09	9	068	01	1	109	43	RCL
028	04	4	069	07	7	110	03	03
029	95	=	070	03	3	111	85	+
030	42	STO	071	09	9	112	43	RCL
031	02	02	072	03	3	113	04	04
032	91	R/S	073	02	2	114	85	+
033	76	LBL	074	95	=	115	43	RCL
034	13	C	075	42	STO	116	05	05
035	65	×	076	05	05	117	85	+
036	93	.	077	91	R/S	118	43	RCL
037	07	7	078	76	LBL	119	06	06
038	09	9	079	16	A'	120	95	=
039	05	5	080	65	×	121	91	R/S
040	09	9	081	93	.	122	81	RST

V23				
V21	V7	V8L1	V2L3	V5L2

V27--Percent Total Value of NSN's on Hand Which Have an RO

000	76	LBL
001	11	A
002	65	×
003	93	.
004	00	0
005	00	0
006	01	1
007	06	6
008	02	2
009	09	9
010	94	+/-
011	95	=
012	42	STO
013	01	01
014	91	R/S
015	76	LBL
016	12	B
017	65	×
018	93	.
019	00	0
020	00	0
021	01	1
022	04	4
023	05	5
024	03	3
025	07	7
026	02	2
027	95	=
028	44	SUM
029	01	01
030	91	R/S
031	76	LBL
032	13	C
033	42	STO
034	02	02
035	91	R/S
036	76	LBL
037	14	D
038	42	STO
039	03	03
040	43	RCL
041	02	02
042	55	÷
043	43	RCL
044	03	03
045	95	=
046	65	×
047	02	2
048	09	9
049	93	.
050	08	8
051	05	5
052	03	3
053	04	4
054	94	+/-
055	95	=
056	44	SUM
057	01	01
058	91	R/S
059	76	LBL
060	15	E
061	65	×
062	93	.
063	00	0
064	00	0
065	00	0
066	08	8
067	01	1
068	09	9
069	01	1
070	08	8
071	94	+/-
072	95	=
073	44	SUM
074	01	01
075	91	R/S
076	76	LBL
077	16	A'
078	65	×
079	93	.
080	03	3
081	04	4
082	08	8
083	07	7
084	02	2
085	06	6
086	94	+/-
087	95	=
088	44	SUM
089	01	01
090	91	R/S
091	09	9
092	03	3
093	93	.
094	06	6
095	03	3
096	08	8
097	08	8
098	85	+
099	43	RCL
100	01	01
101	95	=
102	91	R/S
103	81	RST

V9L3				
V20	V5	V2L2	V31L3	V3

V28--Regular and Hot Item Backorders Released

000	76	LBL	04	03	03	082	42	STO	124	06	06
001	11	A	042	91	R/S	083	06	06	125	85	+
002	65	×	043	76	LBL	084	91	R/S	126	43	RCL
003	03	3	044	14	D	085	76	LBL	127	07	07
004	08	8	045	65	×	086	17	B'	128	95	=
005	01	1	046	93	.	087	65	×	129	91	R/S
006	93	.	047	01	1	088	06	6	130	81	RST
007	07	7	048	08	8	089	07	7			
008	01	1	049	05	5	090	93	.			
009	06	6	050	02	2	091	02	2			
010	94	+/-	051	09	9	092	01	1			
011	95	=	052	03	3	093	09	9			
012	42	STO	053	95	=	094	07	7			
013	01	01	054	42	STO	095	94	+/-			
014	91	R/S	055	04	04	096	95	=			
015	76	LBL	056	91	R/S	097	42	STO			
016	12	B	057	76	LBL	098	07	07			
017	65	×	058	15	E	099	91	R/S			
018	04	4	059	65	×	100	09	9			
019	01	1	060	93	.	101	02	2			
020	06	6	061	05	5	102	07	7			
021	93	.	062	05	5	103	04	4			
022	07	7	063	00	0	104	93	.			
023	09	9	064	04	4	105	02	2			
024	05	5	065	00	0	106	02	2			
025	95	=	066	07	7	107	85	+			
026	42	STO	067	94	+/-	108	43	RCL			
027	02	02	068	95	=	109	01	01			
028	91	R/S	069	42	STO	110	85	+			
029	76	LBL	070	05	05	111	43	RCL			
030	13	C	071	91	R/S	112	02	02			
031	65	×	072	76	LBL	113	85	+			
032	01	1	073	16	A'	114	43	RCL			
033	93	.	074	65	×	115	03	03			
034	07	7	075	93	.	116	85	+			
035	01	1	076	02	2	117	43	RCL			
036	01	1	077	04	4	118	04	04			
037	08	8	078	04	4	119	85	+			
038	05	5	079	09	9	120	43	RCL			
039	95	=	080	02	2	121	05	05			
040	42	STO	081	95	=	122	85	+			
						123	43	RCL			

V28L3	V1			
V2L1	V1L1	V31L1	V16	V18

V29--Regular and Hot Item Backorders Established

000	76	LBL
001	11	A
002	65	×
003	04	4
004	01	1
005	93	.
006	09	9
007	02	2
008	03	3
009	09	9
010	94	+/-
011	95	=
012	42	STO
013	01	01
014	91	R/S
015	76	LBL
016	12	B
017	65	×
018	02	2
019	06	6
020	04	4
021	93	.
022	06	6
023	06	6
024	02	2
025	94	+/-
026	95	=
027	42	STO
028	02	02
029	91	R/S
030	76	LBL
031	13	C
032	65	×
033	93	.
034	02	2
035	06	6
036	03	3
037	00	0
038	04	4
039	08	8
040	95	=

041	42	STO
042	03	03
043	91	R/S
044	76	LBL
045	14	D
046	65	×
047	93	.
048	02	2
049	02	2
050	01	1
051	00	0
052	06	6
053	00	0
054	95	=
055	42	STO
056	04	04
057	91	R/S
058	76	LBL
059	15	E
060	65	×
061	02	2
062	93	.
063	00	0
064	09	9
065	09	9
066	05	5
067	05	5
068	94	+/-
069	95	=
070	42	STO
071	05	05
072	91	R/S
073	76	LBL
074	16	A'
075	65	×
076	93	.
077	03	3
078	05	5
079	09	9
080	06	6
081	00	0

082	01	1
083	94	+/-
084	95	=
085	42	STO
086	06	06
087	91	R/S
088	76	LBL
089	17	B'
090	65	×
091	01	1
092	03	3
093	05	5
094	93	.
095	07	7
096	07	7
097	05	5
098	95	=
099	42	STO
100	07	07
101	91	R/S
102	76	LBL
103	18	C'
104	65	×
105	01	1
106	04	4
107	06	6
108	93	.
109	02	2
110	02	2
111	01	1
112	94	+/-
113	95	=
114	42	STO
115	08	08
116	91	R/S
117	76	LBL
118	19	D'
119	65	×
120	93	.
121	02	2
122	02	2

123	02	2
124	07	7
125	09	9
126	03	3
127	95	=
128	42	STO
129	09	09
130	91	R/S
131	76	LBL
132	10	E'
133	65	×
134	93	.
135	00	0
136	03	3
137	06	6
138	01	1
139	01	1
140	07	7
141	01	1
142	94	+/-
143	95	=
144	42	STO
145	10	10
146	91	R/S
147	02	2
148	05	5
149	04	4
150	06	6
151	00	0
152	93	.
153	05	5
154	85	+
155	43	RCL
156	01	01
157	85	+
158	43	RCL
159	02	02
160	85	+
161	43	RCL
162	03	03
163	85	+
164	43	RCL
165	04	04
166	85	+
167	43	RCL
168	05	05

V7L1	V2L1	V1L1	V29L2	V16L3
V26L1	V2	V16	V7L3	V13

V29--Regular and Hot Item Backorders Established (continued)

169 85 + 170 43 RCL 171 06 06 172 85 + 173 43 RCL 174 07 07 175 85 + 176 43 RCL 177 08 08 178 85 + 179 43 RCL 180 09 09 181 85 + 182 43 RCL 183 10 10 184 95 = 185 91 R/S 186 81 RST			

V30--AOA Dollar Value

000	76	LBL	042	04	04	084	18	C'	126	05	5
001	11	A	043	43	RCL	085	42	STO	127	02	2
002	65	×	044	02	02	086	03	03	128	85	+
003	93	.	045	55	÷	087	43	RCL	129	43	RCL
004	06	6	046	43	RCL	088	02	02	130	01	01
005	09	9	047	03	03	089	55	÷	131	95	=
006	07	7	048	55	÷	090	43	RCL	132	91	R/S
007	03	3	049	43	RCL	091	03	03	133	81	RST
008	00	0	050	04	04	092	95	=			
009	06	6	051	95	=	093	65	×			
010	95	=	052	65	×	094	93	.			
011	42	STO	053	07	7	095	00	0			
012	01	01	054	05	5	096	09	9			
013	91	R/S	055	05	5	097	07	7			
014	76	LBL	056	01	1	098	01	1			
015	12	B	057	02	2	099	05	5			
016	65	×	058	00	0	100	01	1			
017	93	.	059	94	+/-	101	06	6			
018	07	7	060	95	=	102	94	+/-			
019	05	5	061	44	SUM	103	95	=			
020	07	7	062	01	01	104	44	SUM			
021	07	7	063	91	R/S	105	01	01			
022	02	2	064	76	LBL	106	91	R/S			
023	01	1	065	16	A'	107	76	LBL			
024	94	+/-	066	65	×	108	19	D'			
025	95	=	067	93	.	109	65	×			
026	44	SUM	068	01	1	110	93	.			
027	01	01	069	03	3	111	01	1			
028	91	R/S	070	01	1	112	00	0			
029	76	LBL	071	03	3	113	02	2			
030	13	C	072	04	4	114	03	3			
031	42	STO	073	06	6	115	03	3			
032	02	02	074	95	=	116	94	+/-			
033	91	R/S	075	44	SUM	117	95	=			
034	76	LBL	076	01	01	118	44	SUM			
035	14	D	077	91	R/S	119	01	01			
036	42	STO	078	76	LBL	120	91	R/S			
037	03	03	079	17	B'	121	03	3			
038	91	R/S	080	42	STO	122	01	1			
039	76	LBL	081	02	02	123	06	6			
040	15	E	082	91	R/S	124	09	9			
041	42	STO	083	76	LBL	125	93	.			

V11	V23	V24	V7L1	
V12	V12L1	V2L3	V31L2	V30L1

V31--A3A Dollar Value

000	76	LBL	041	55	÷	083	95	=	125	43	RCL
001	11	A	042	43	RCL	084	42	STO	126	06	06
002	65	×	043	04	04	085	05	05	127	95	=
003	93	.	044	54	)	086	91	R/S	128	91	R/S
004	01	1	045	65	×	087	76	LBL	129	81	RST
005	01	1	046	03	3	088	17	B'			
006	04	4	047	09	9	089	65	×			
007	08	8	048	04	4	090	93	.			
008	06	6	049	93	.	091	00	0			
009	03	3	050	03	3	092	09	9			
010	94	+/-	051	09	9	093	00	0			
011	95	=	052	06	6	094	07	7			
012	42	STO	053	94	+/-	095	04	4			
013	01	01	054	95	=	096	00	0			
014	91	R/S	055	42	STO	097	02	2			
015	76	LBL	056	03	03	098	95	=			
016	12	B	057	91	R/S	099	42	STO			
017	65	×	058	76	LBL	100	06	06			
018	01	1	059	15	E	101	91	R/S			
019	01	1	060	65	×	102	04	4			
020	04	4	061	93	.	103	03	3			
021	93	.	062	00	0	104	04	4			
022	05	5	063	09	9	105	03	3			
023	08	8	064	07	7	106	93	.			
024	02	2	065	02	2	107	07	7			
025	95	=	066	04	4	108	06	6			
026	42	STO	067	06	6	109	85	+			
027	02	02	068	01	1	110	43	RCL			
028	91	R/S	069	94	+/-	111	01	01			
029	76	LBL	070	95	=	112	85	+			
030	13	C	071	42	STO	113	43	RCL			
031	42	STO	072	04	04	114	02	02			
032	03	03	073	91	R/S	115	85	+			
033	91	R/S	074	76	LBL	116	43	RCL			
034	76	LBL	075	16	A'	117	03	03			
035	14	D	076	65	×	118	85	+			
036	42	STO	077	93	.	119	43	RCL			
037	04	04	078	07	7	120	04	04			
038	53	(	079	00	0	121	85	+			
039	43	RCL	080	04	4	122	43	RCL			
040	03	03	081	07	7	123	05	05			
			082	01	1	124	85	+			

V13L2	V30L3			
V7	V32	V2	V30	V7L3

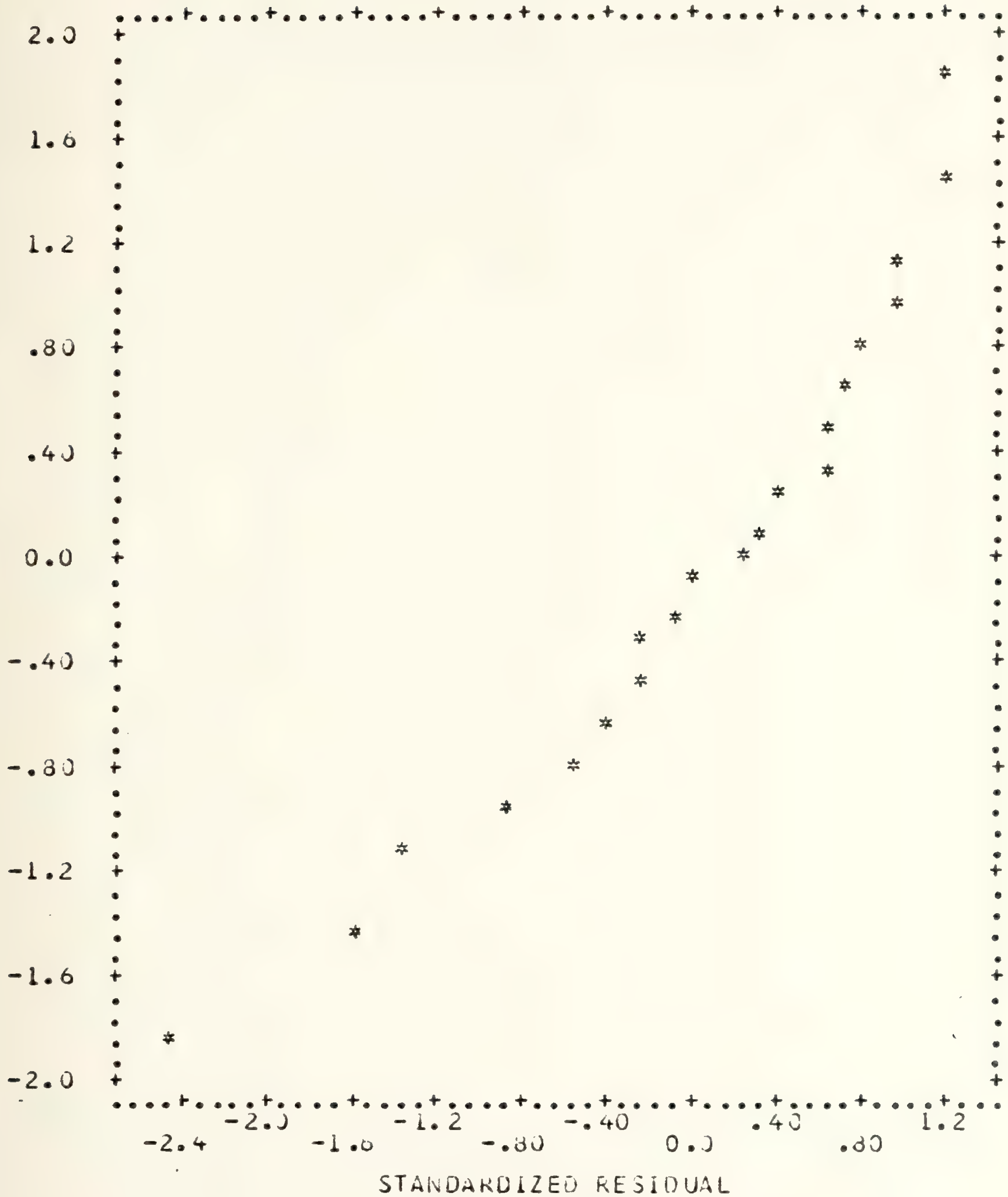
APPENDIX D: NORMAL PROBABILITY PLOTS OF THE RESIDUALS

For each of the equations, developed in Chapter IV, an assumption was made that the error terms (residuals) were normally distributed, that is, symmetrical about the mean, with a kurtosis of 3.0, and with a spread such that 68% of the values all within one standard deviation of the mean, 95% of the values within two standard deviations, and 99% of the values within three standard deviations. Should the error terms not be normally distributed, the coefficient of determination is not reliable as an indicator of how much of the variance of the dependent variables is explained by the variance of the independent variables in the regression equation. A graph showing a normal distribution for the residuals would appear as a straight line ascending from left to right with equal values to each side of it along the x-axis and a similar splitting of different values along the y-axis.

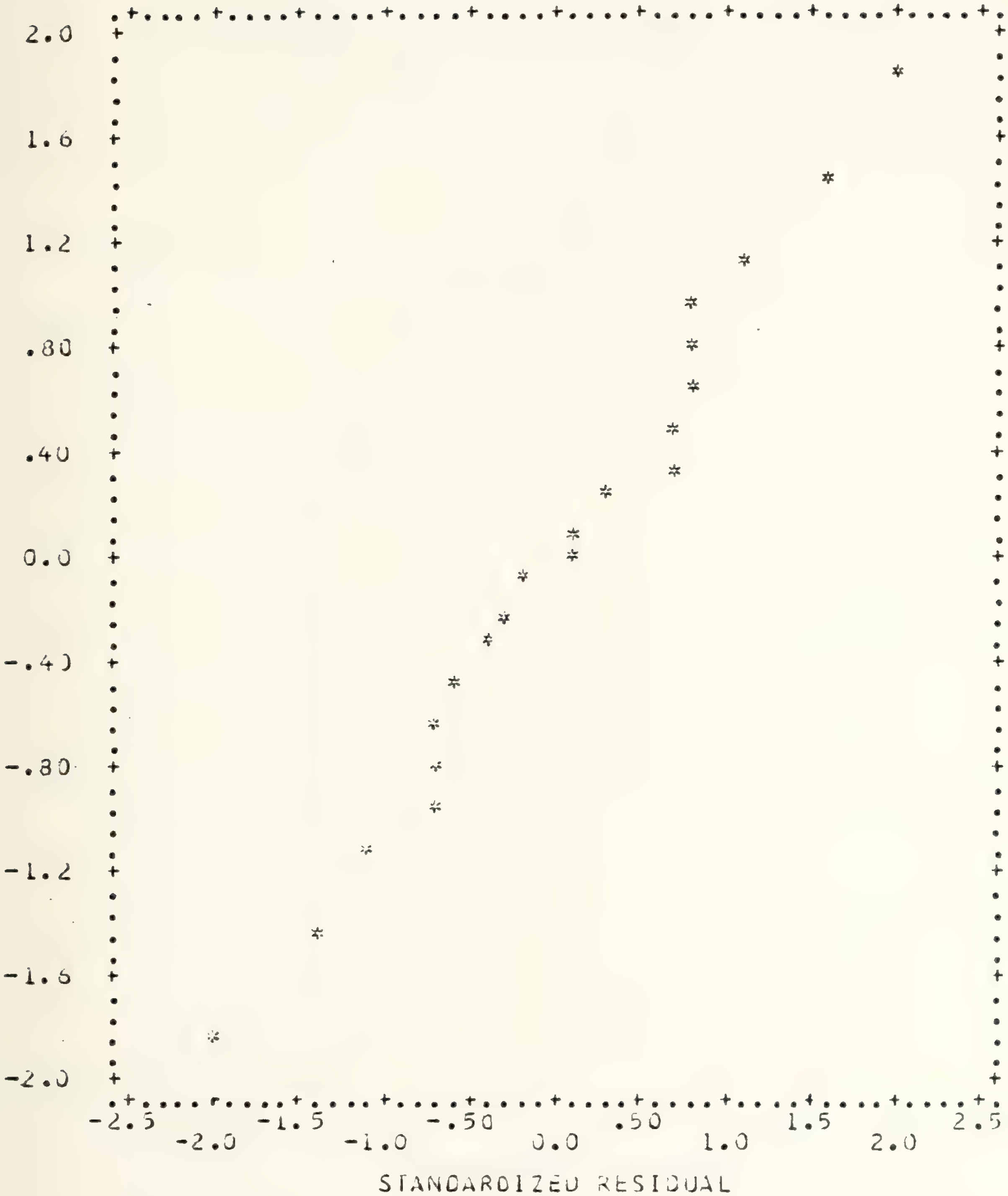
As can be seen by moving through the appendix, the error terms are very close to being normally distributed. The

graphs were included for the purpose of convincing the reader that the Chapter IV equations were properly based on the assumption that the error terms are normally distributed; thus, the coefficient of determination values are believable. Note that the expected normal values are plotted on the Y-axis and the standardized residuals are plotted on the X-axis.

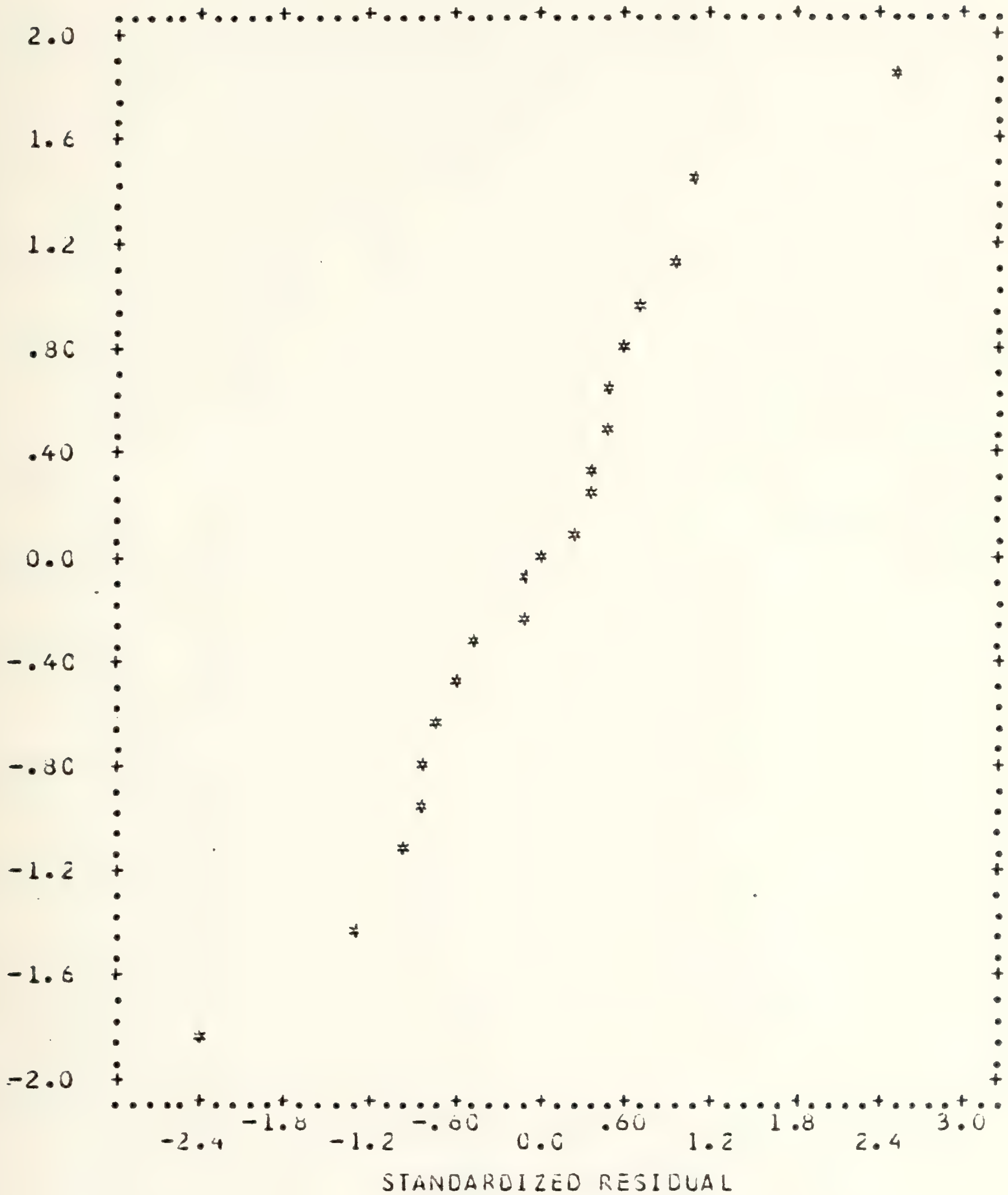
V1--Complete Fill Rate



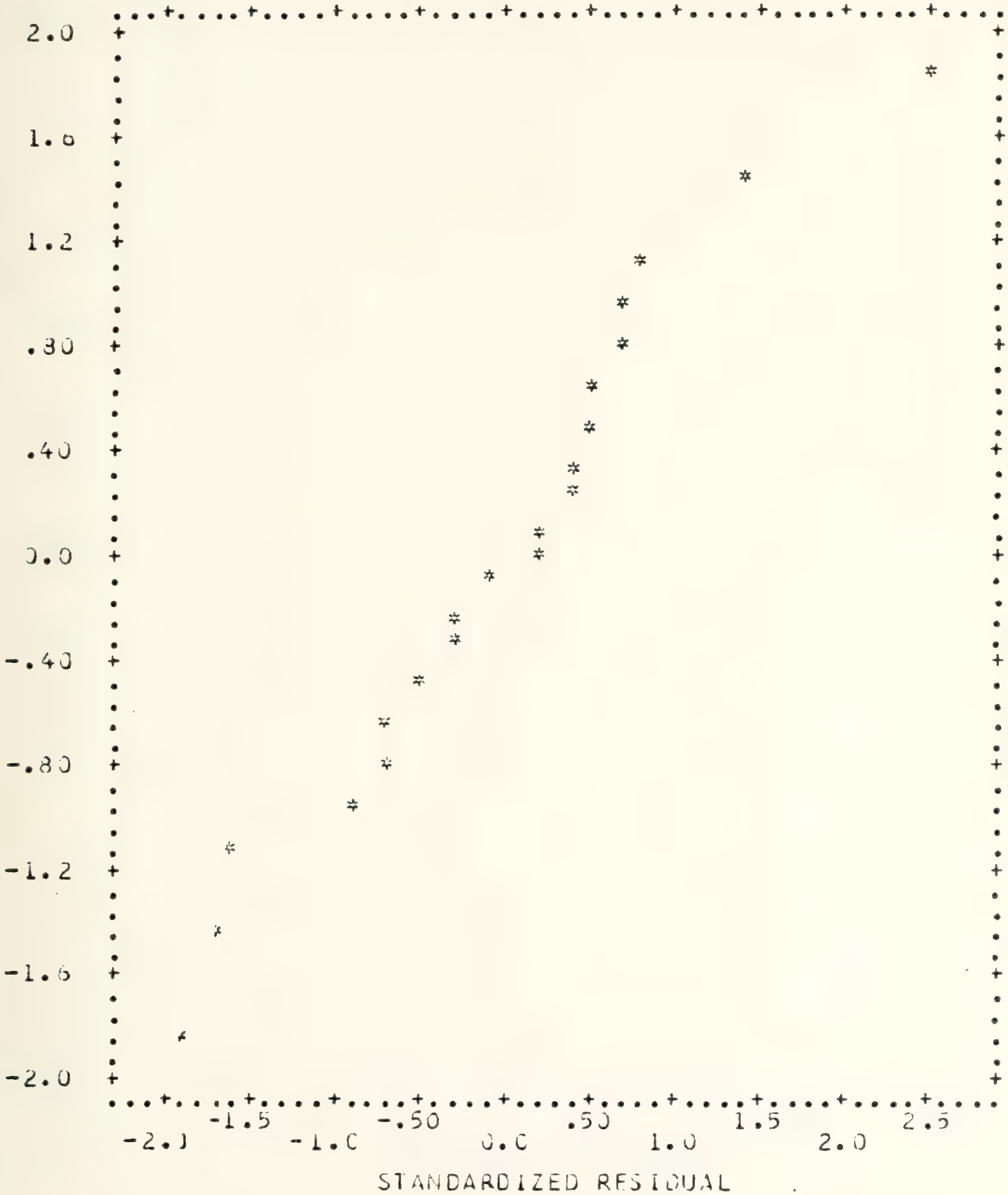
V2--RO Fill Rate



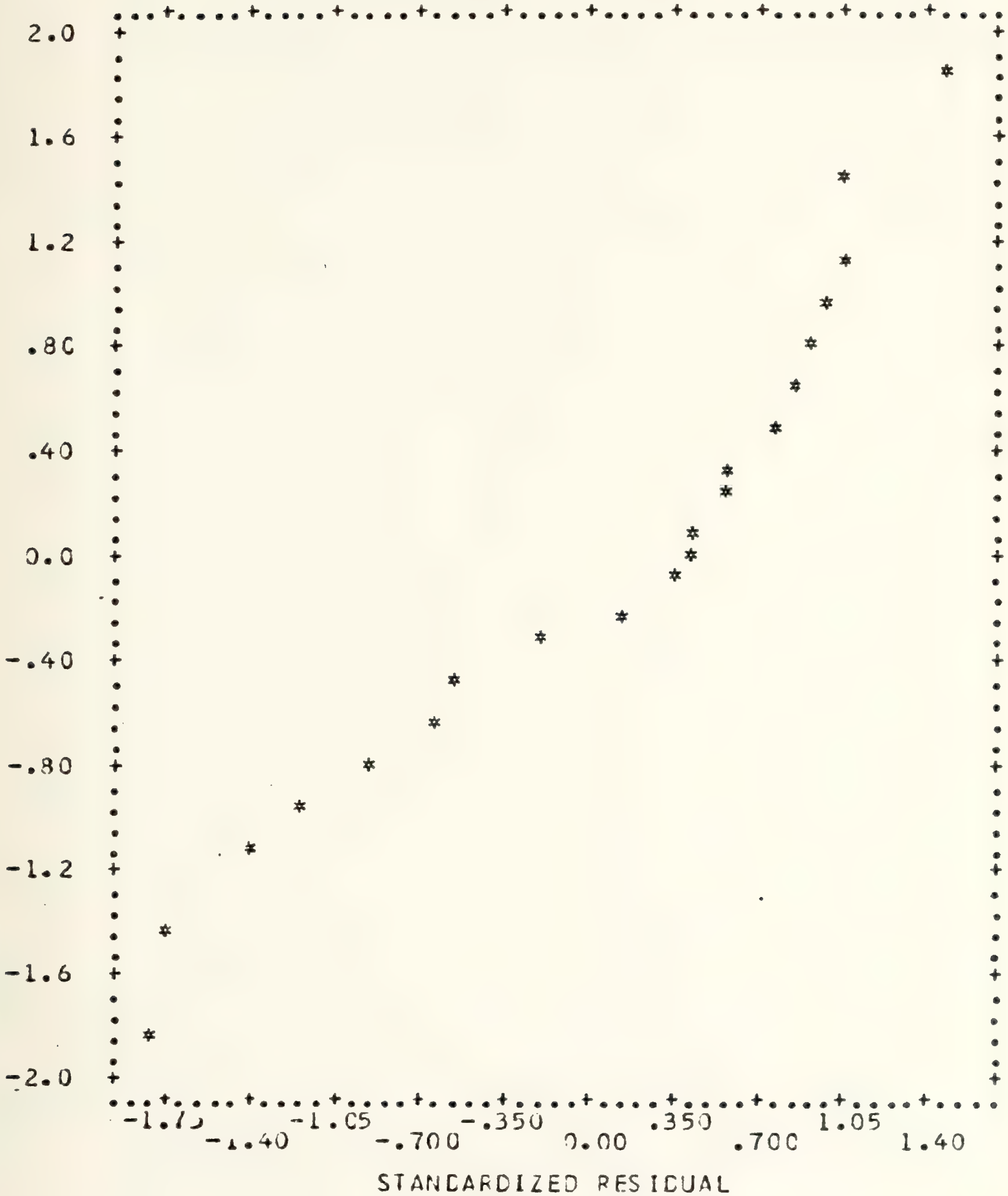
V3--Number of NSN's on Hand



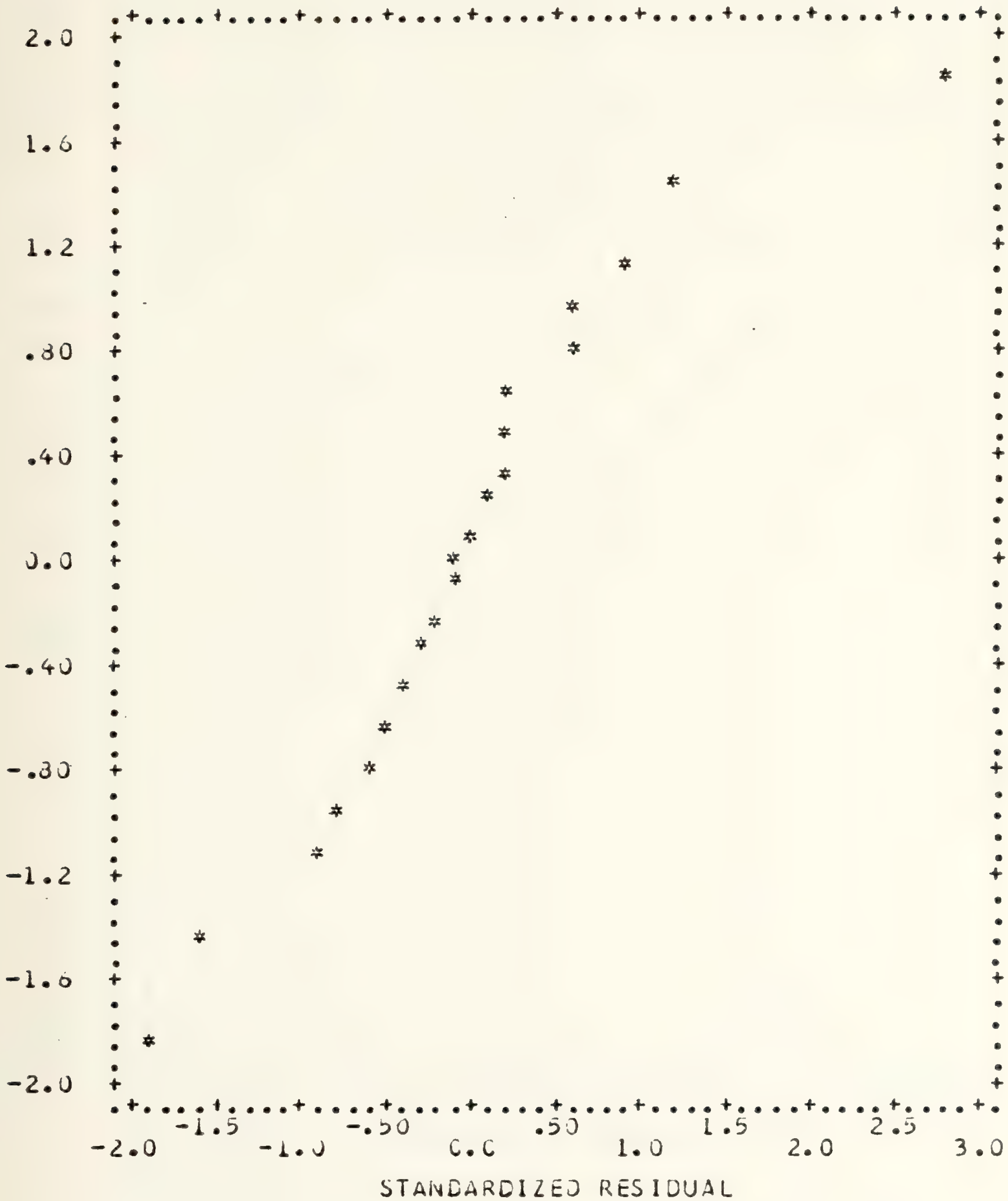
V4--Dollar Value of NSN's on Hand



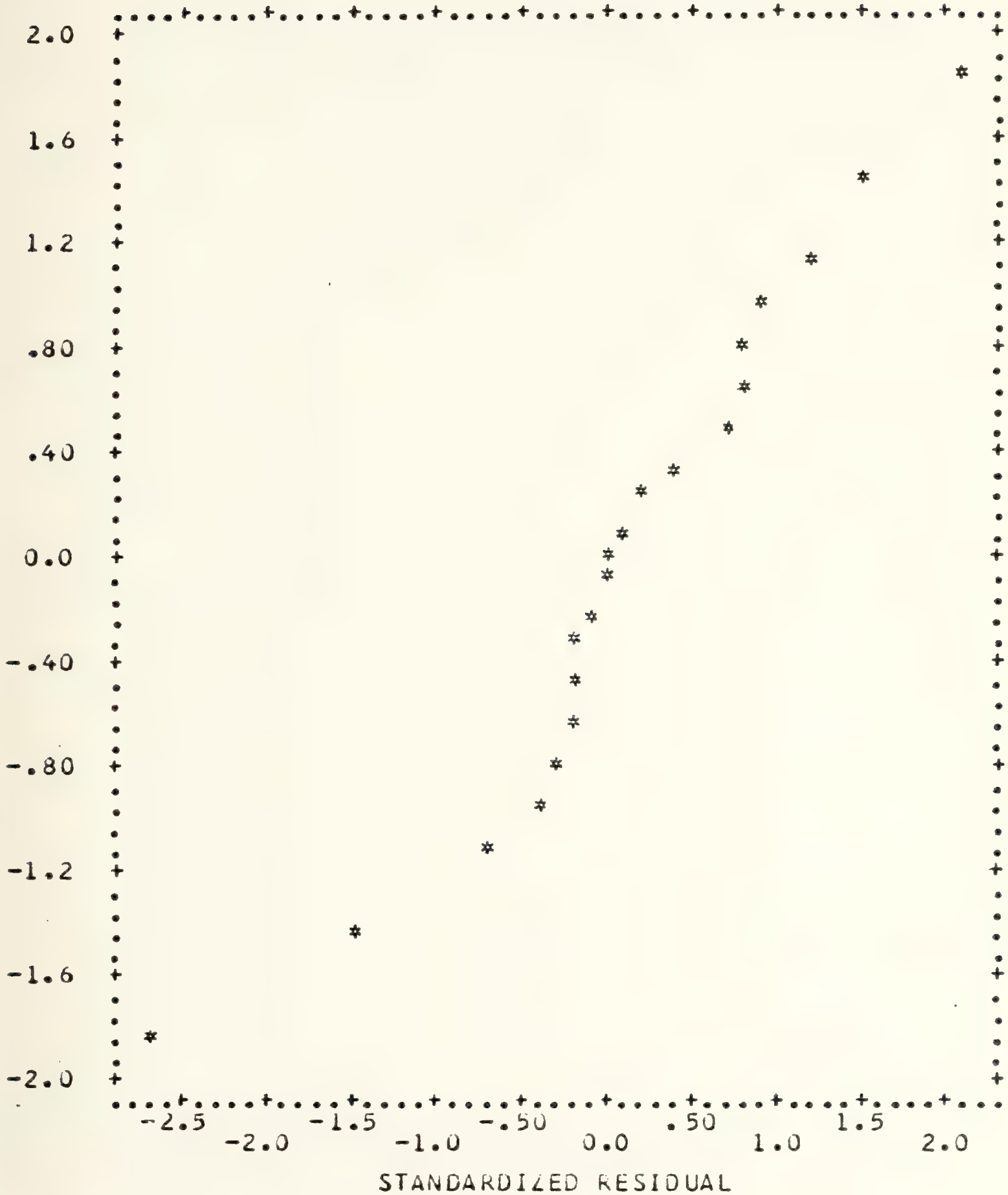
V5--Number of NSN's with an RO



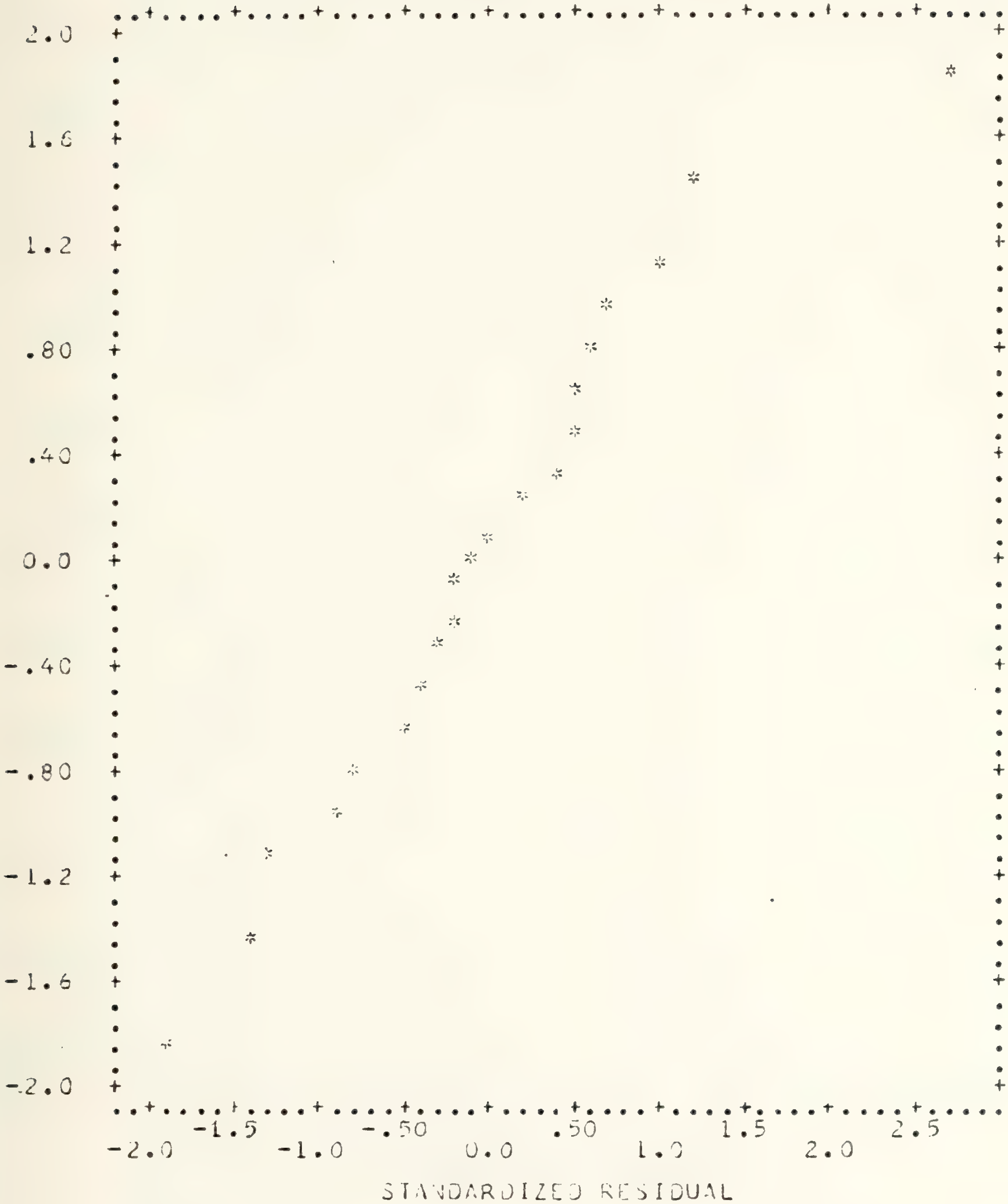
V6--Dollar Value of NSN's with an RO



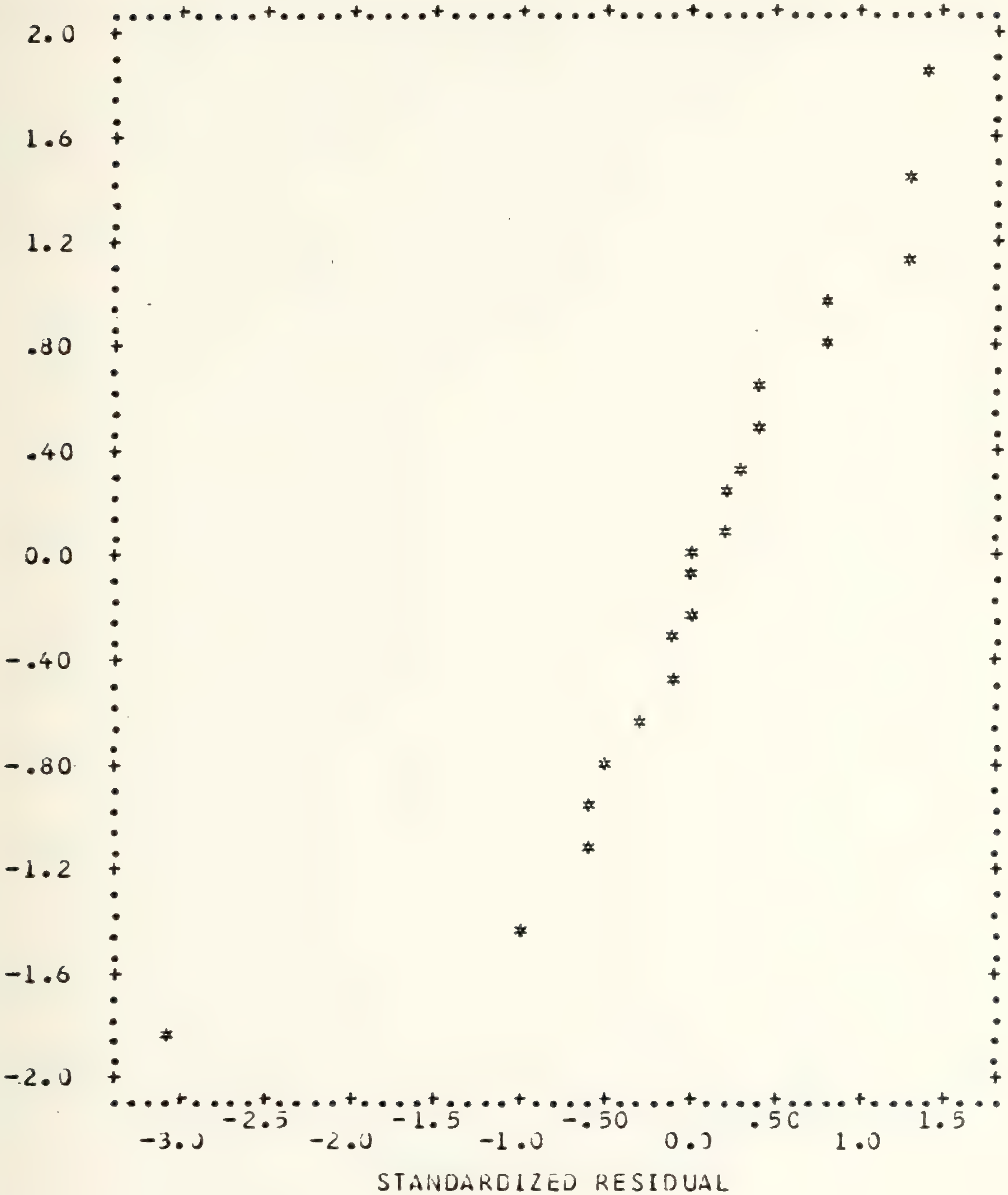
V7--Number of RO NSN's on Hand



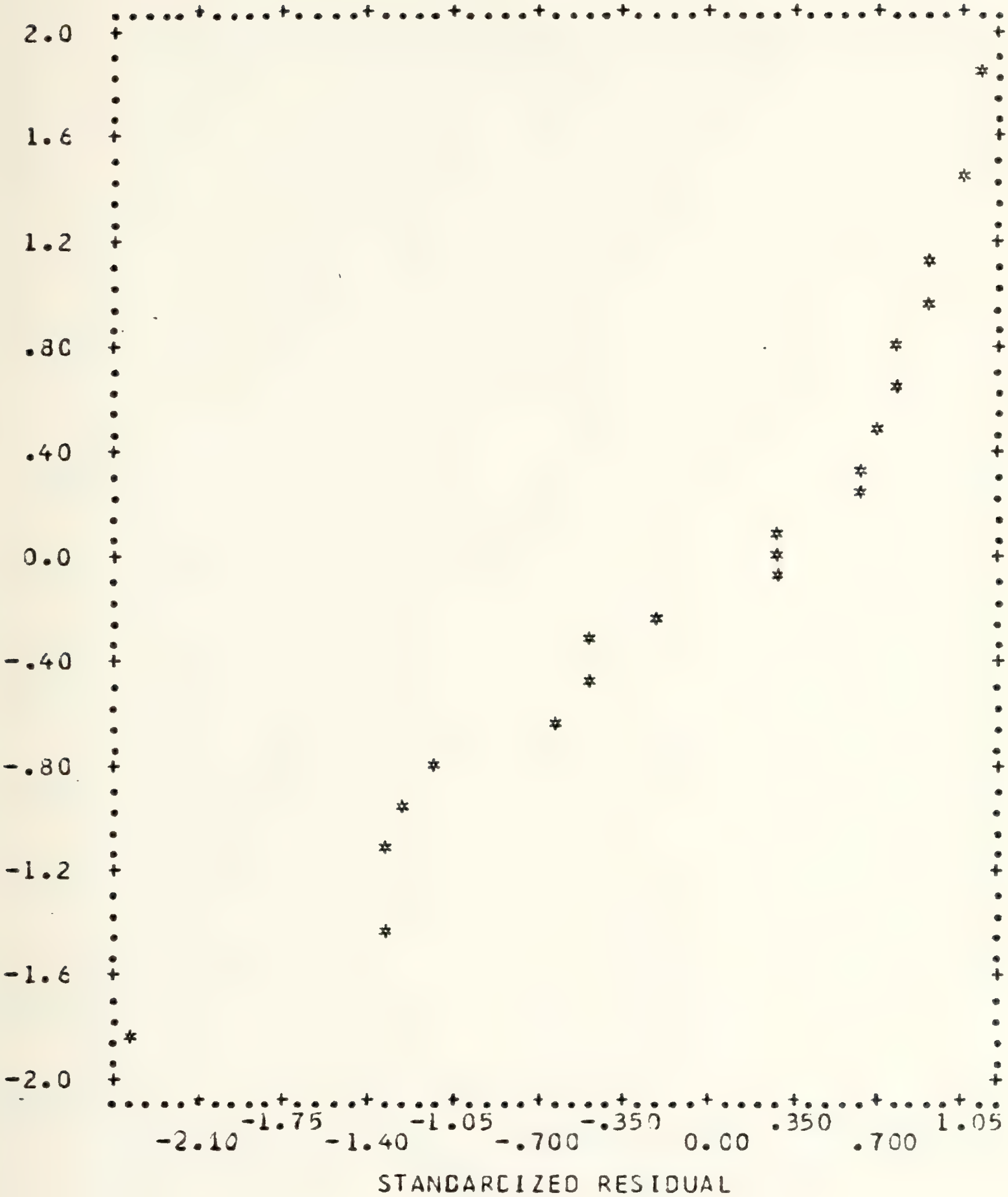
V8--Dollar Value of RO NSN's on Hand



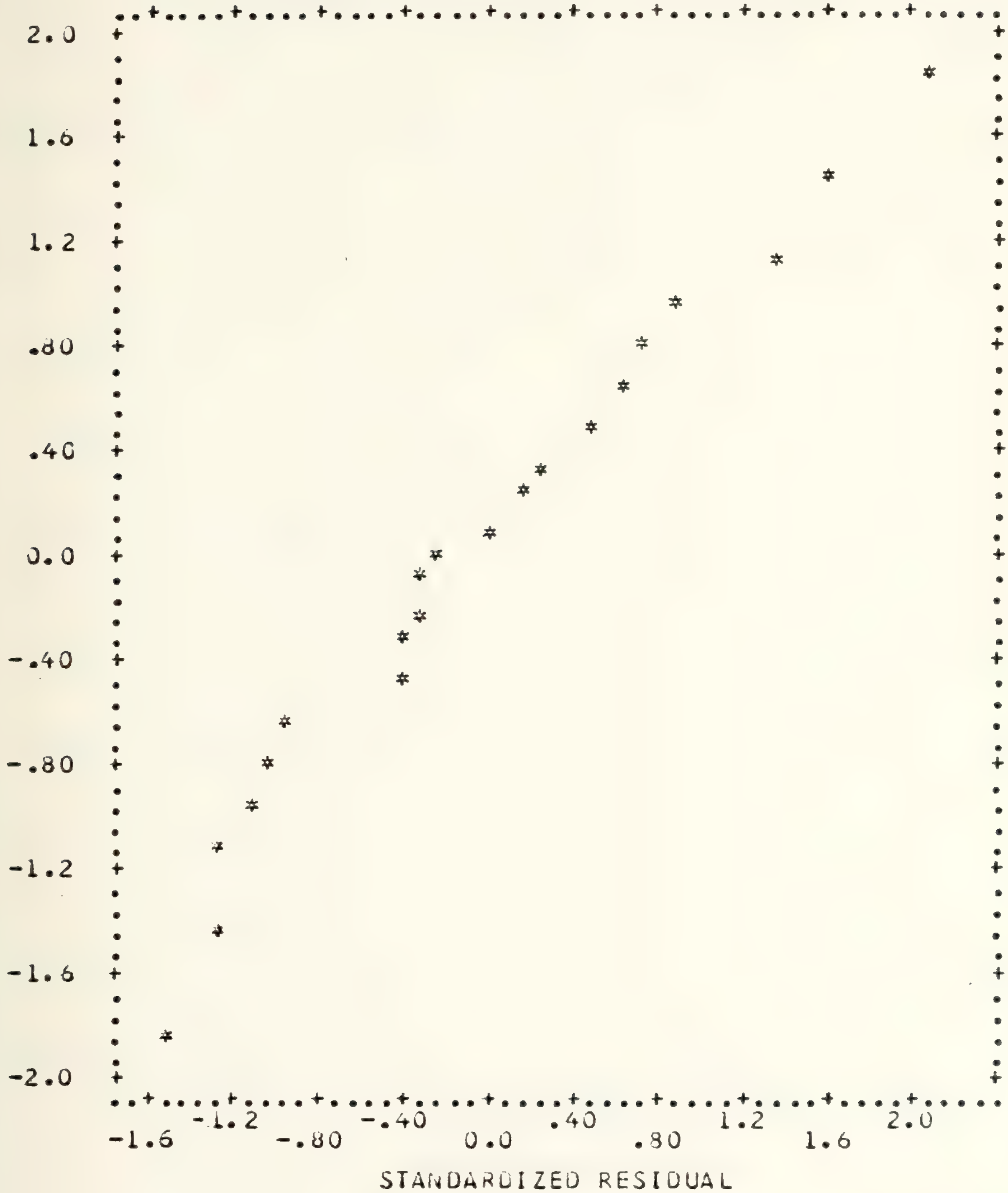
V9--Percent Availability of RO NSN's on Hand



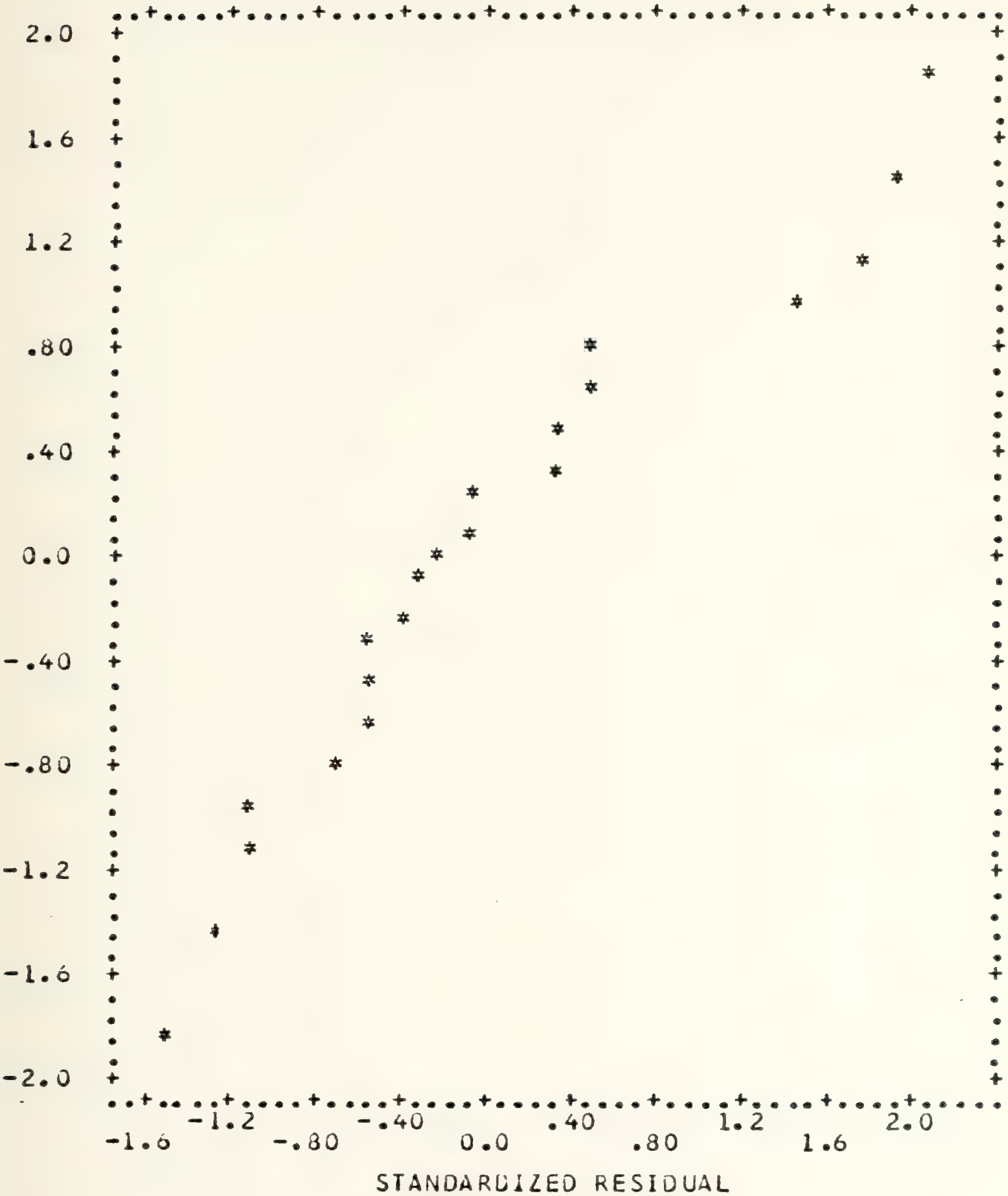
V10--Receipts from Due



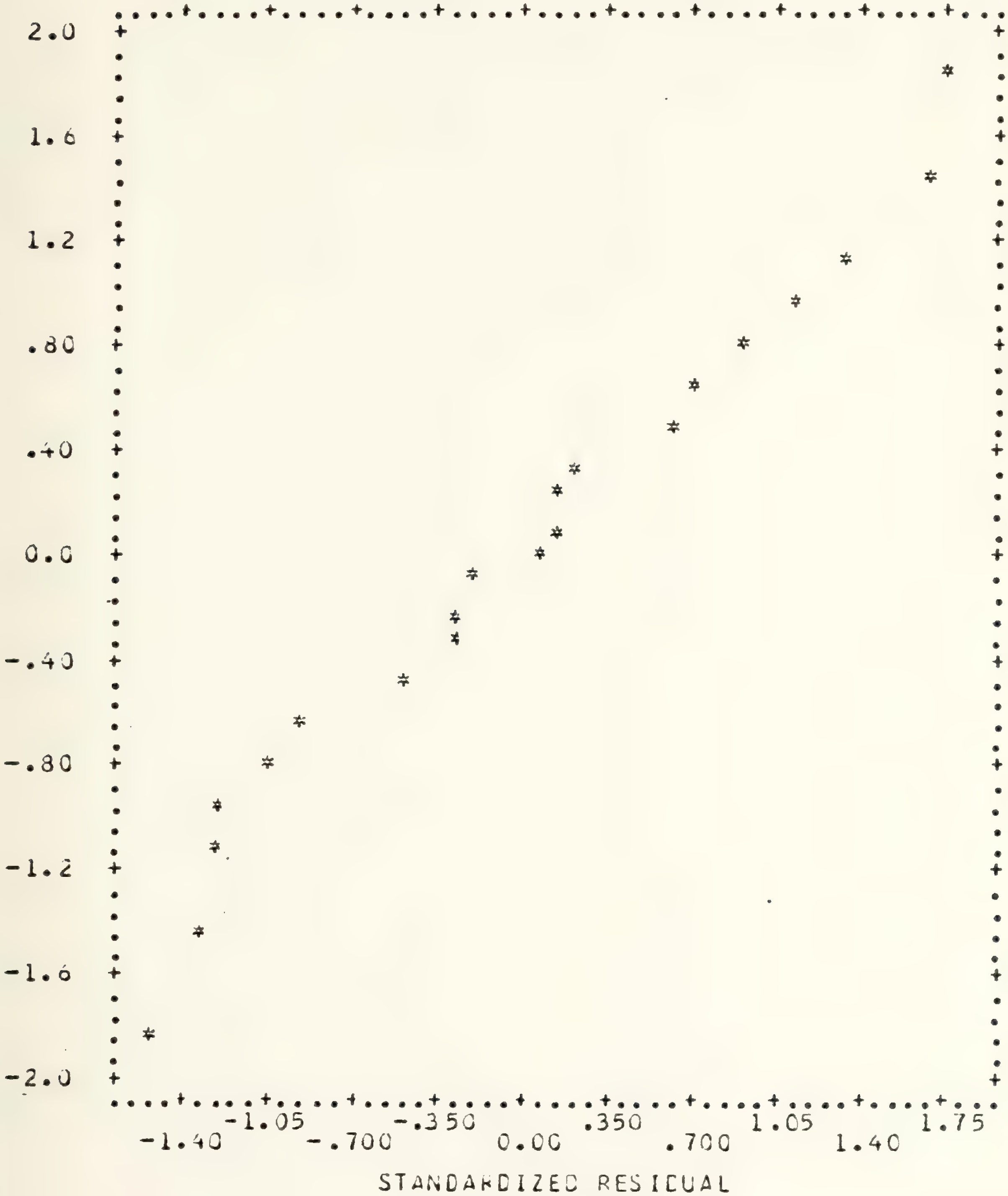
V11--Number of NSN's with Dues



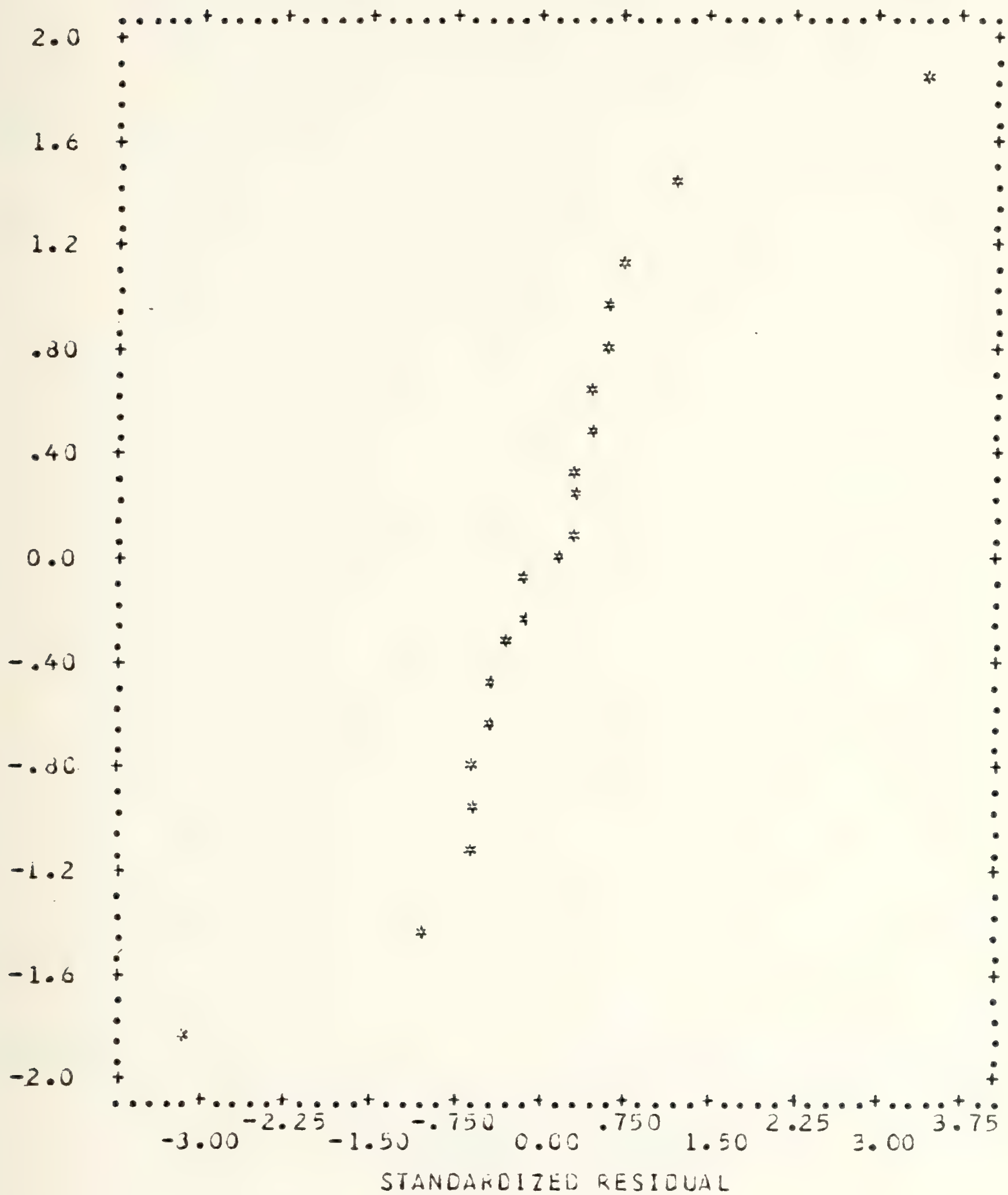
V12--Dollar Value of NSN's with Dues



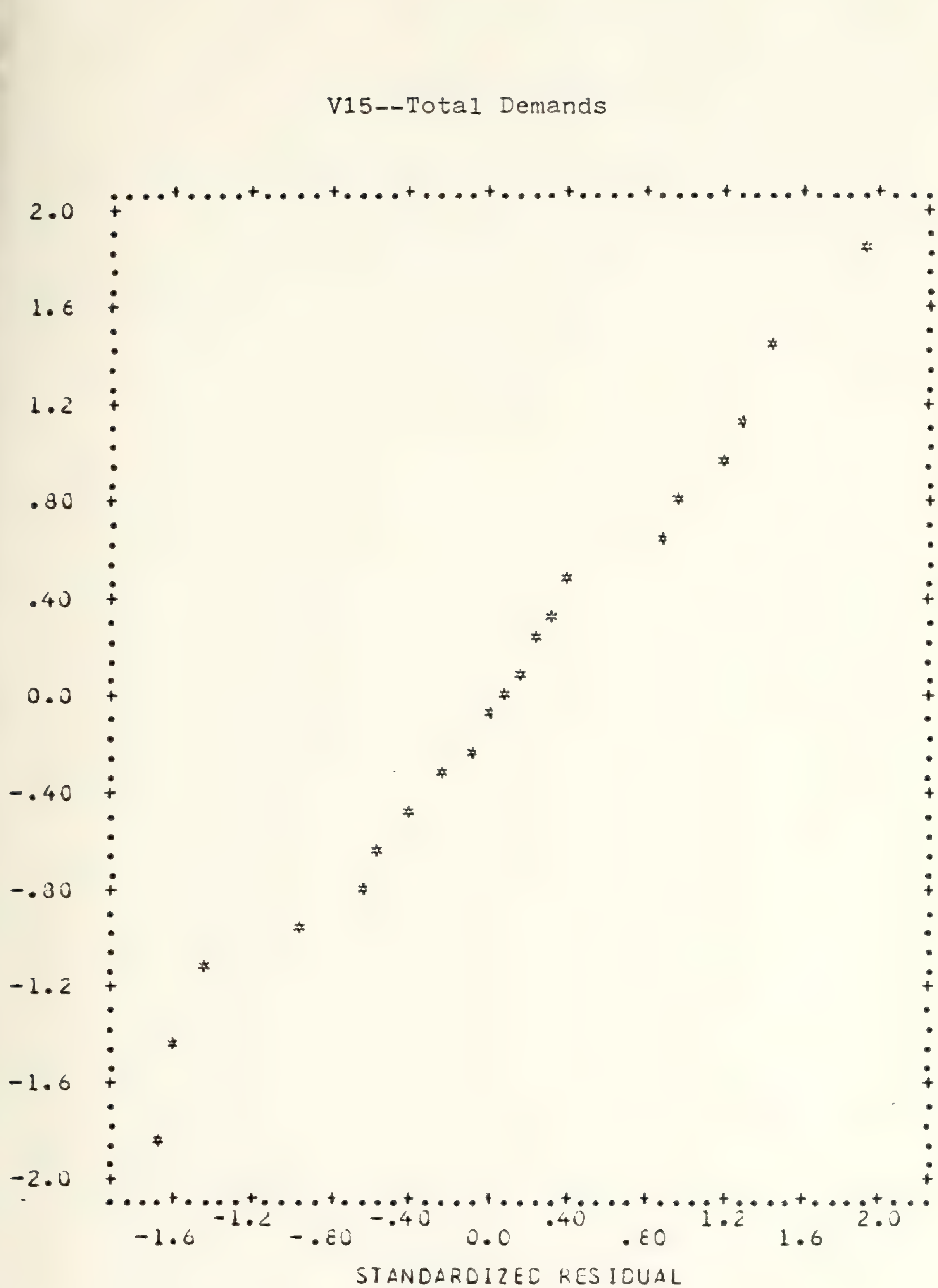
V13--Number of NSN's with Excess Dues Over Req + RO



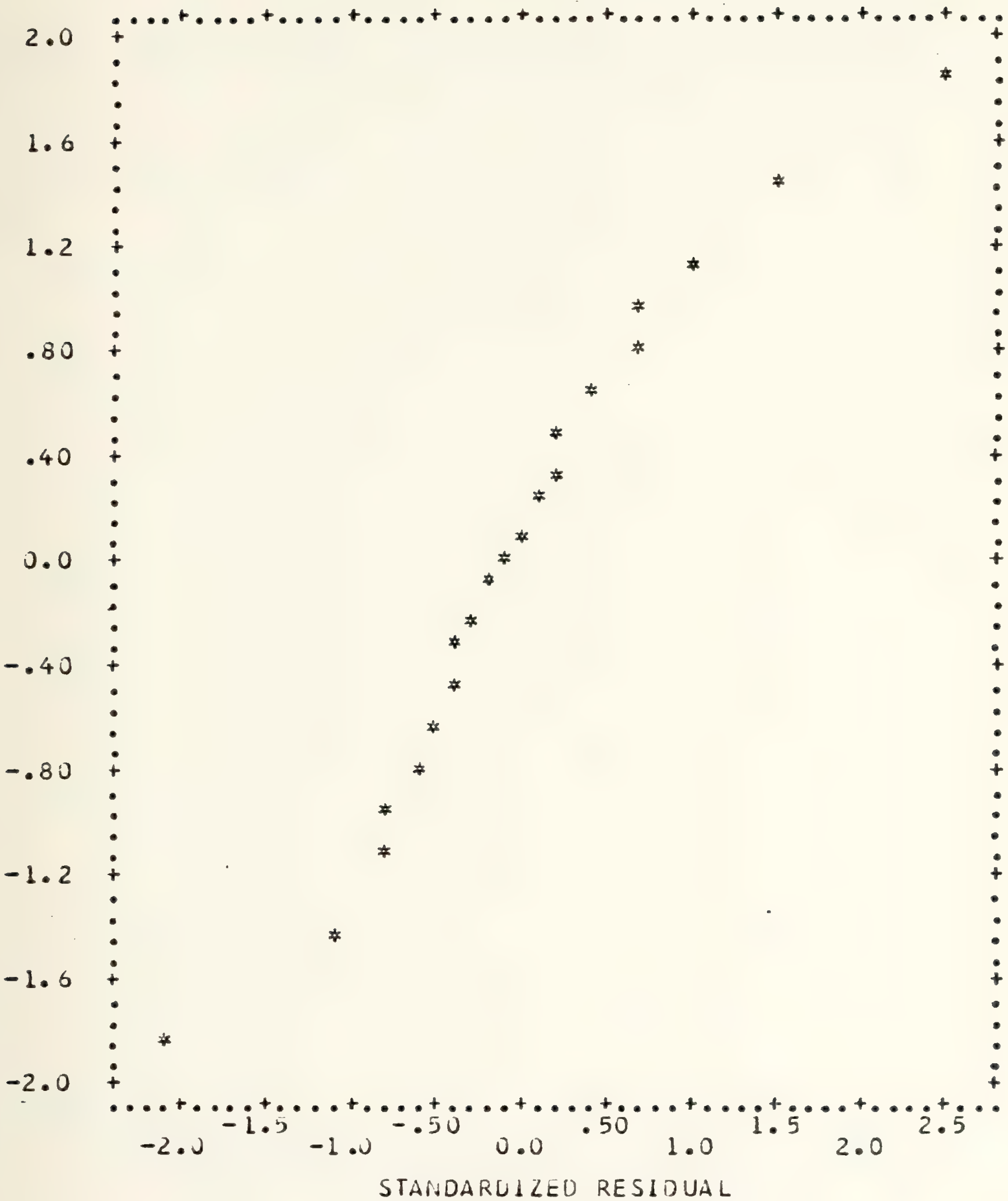
V14--Dollar Value of Excess Dues Over REQ + ERQ



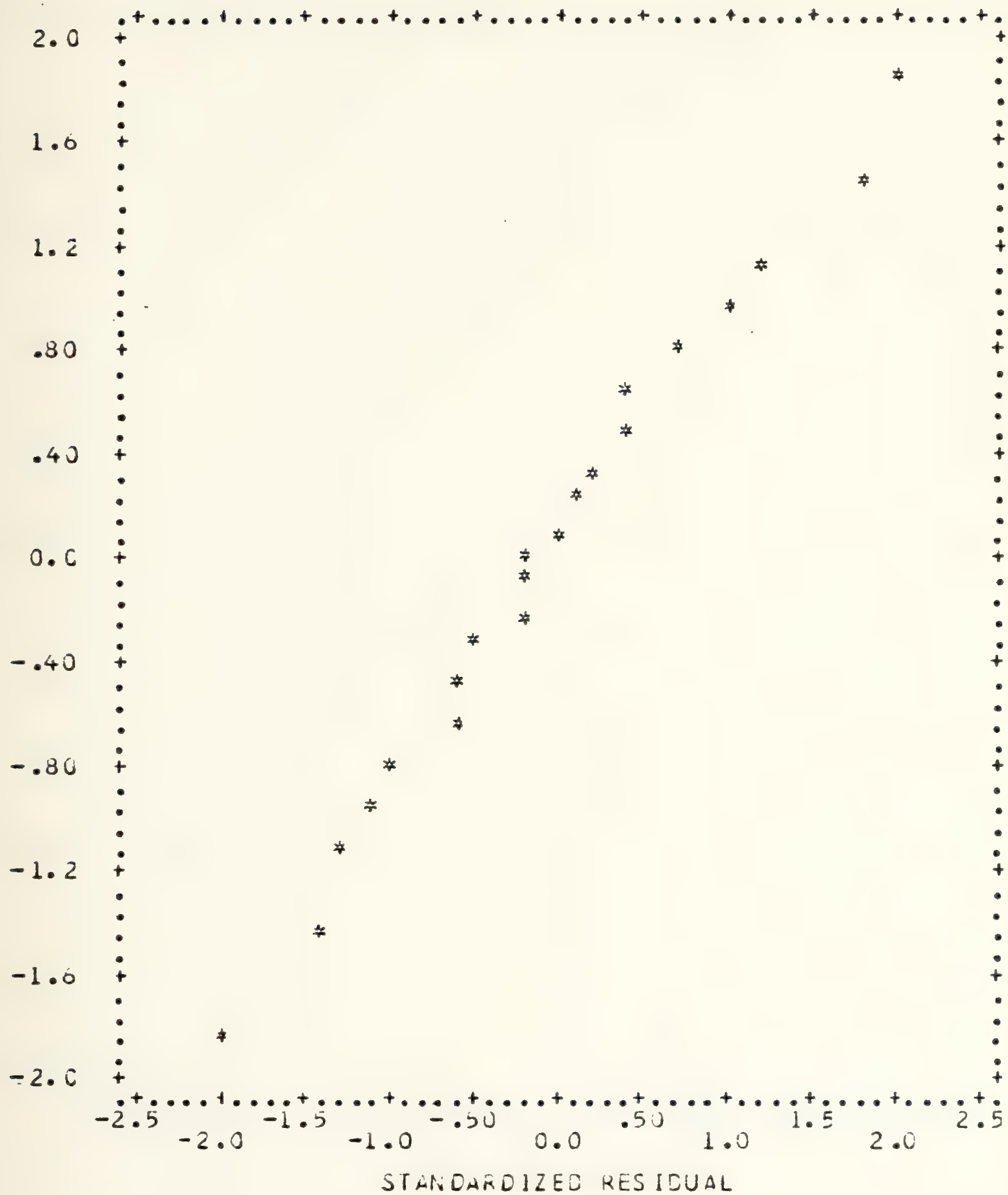
V15--Total Demands



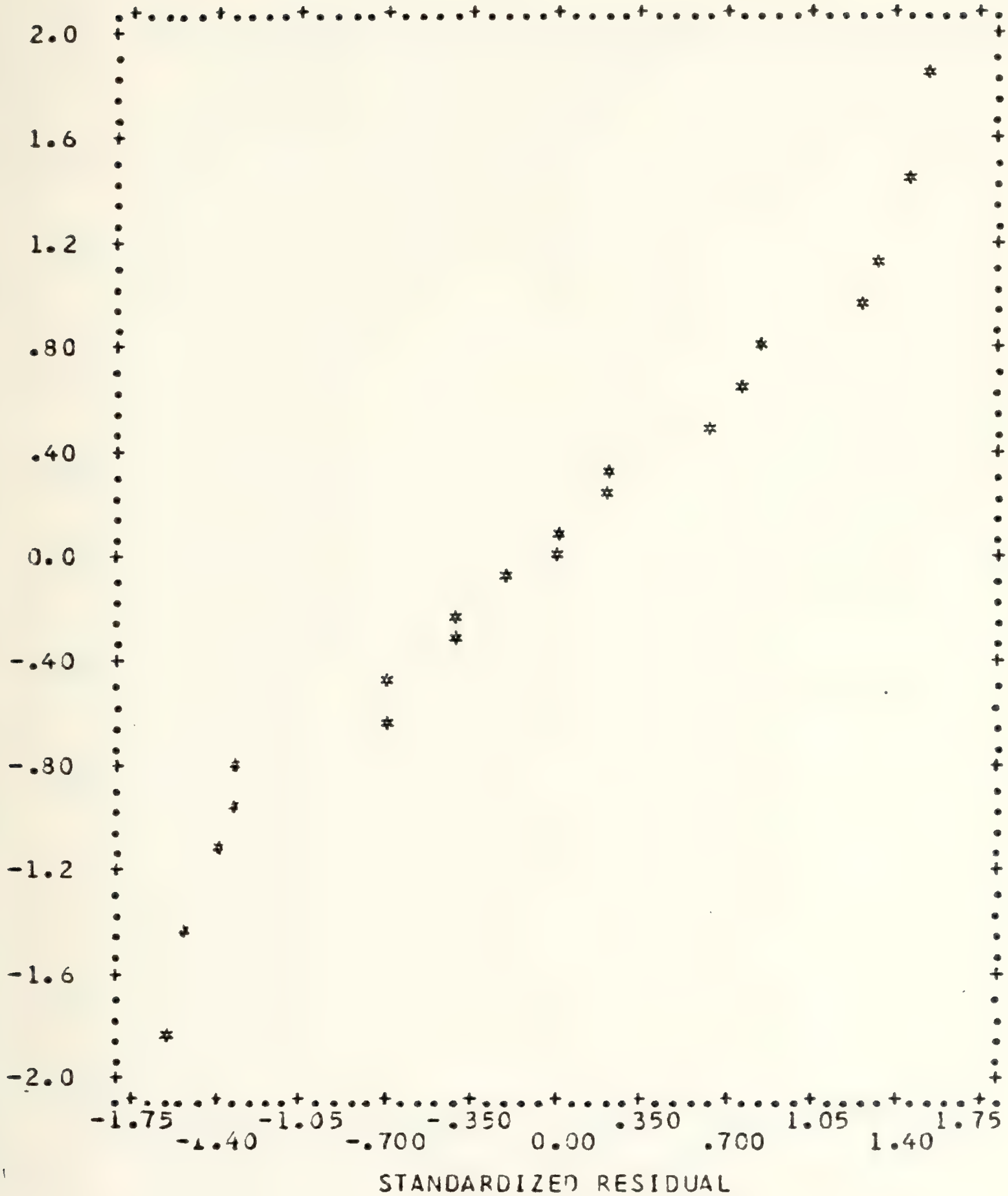
V16--RO Demands



V17--Percent Demands for RO Items

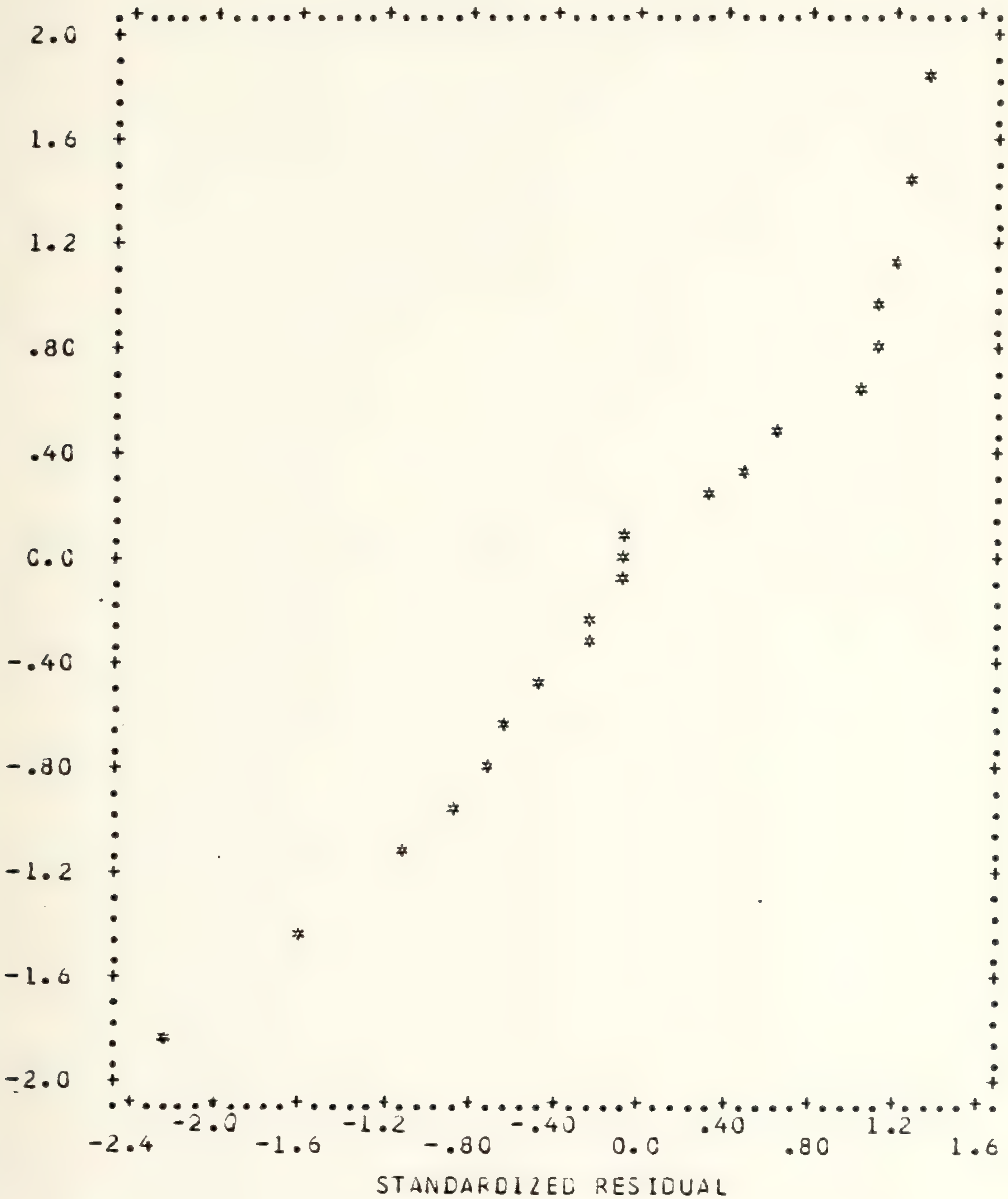


V18--Number of Backorders

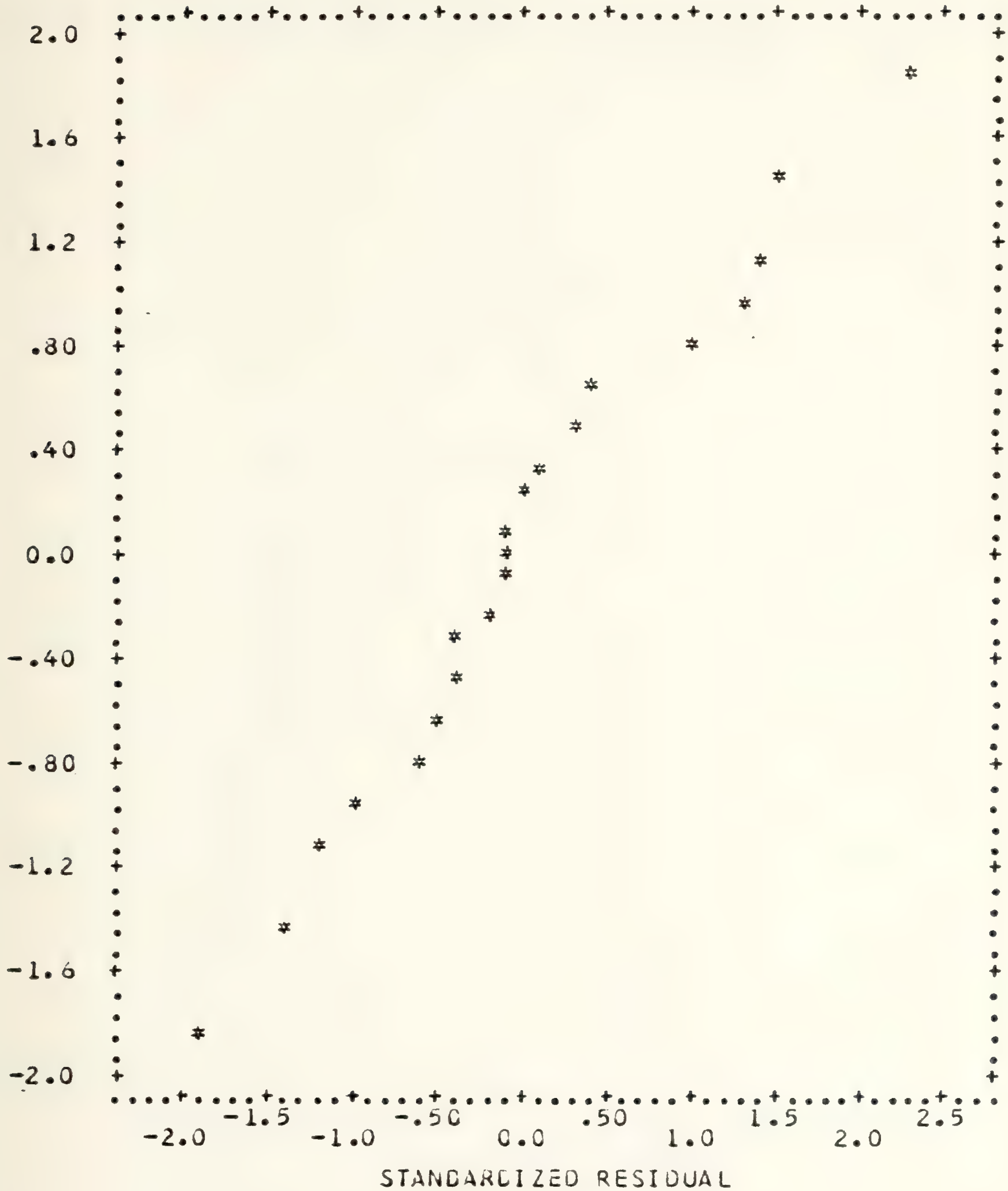


V19--Number of NSN's with RO REQ Not on Order

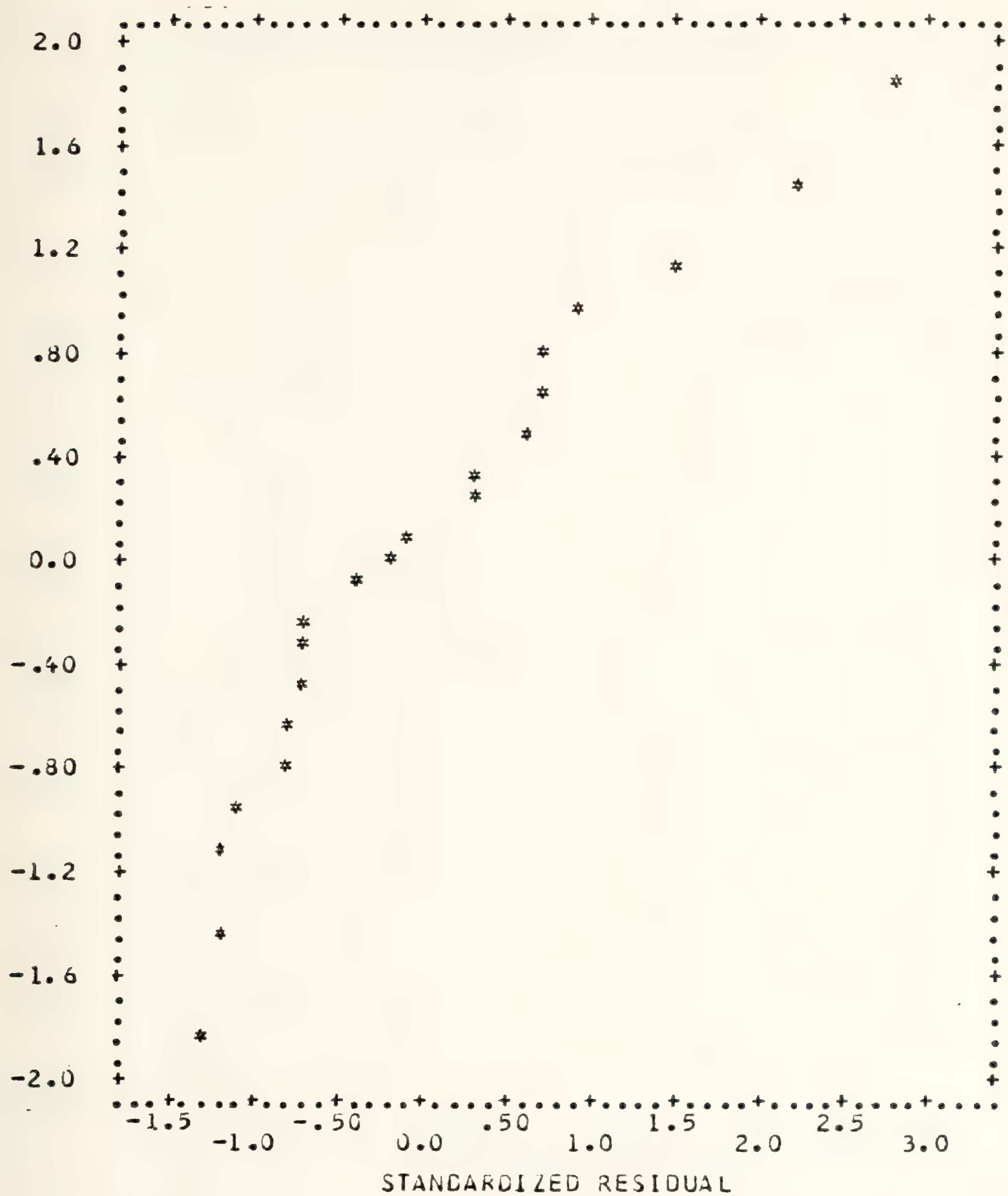
V20--Dollar Value of NSN's with REQ But not on Order



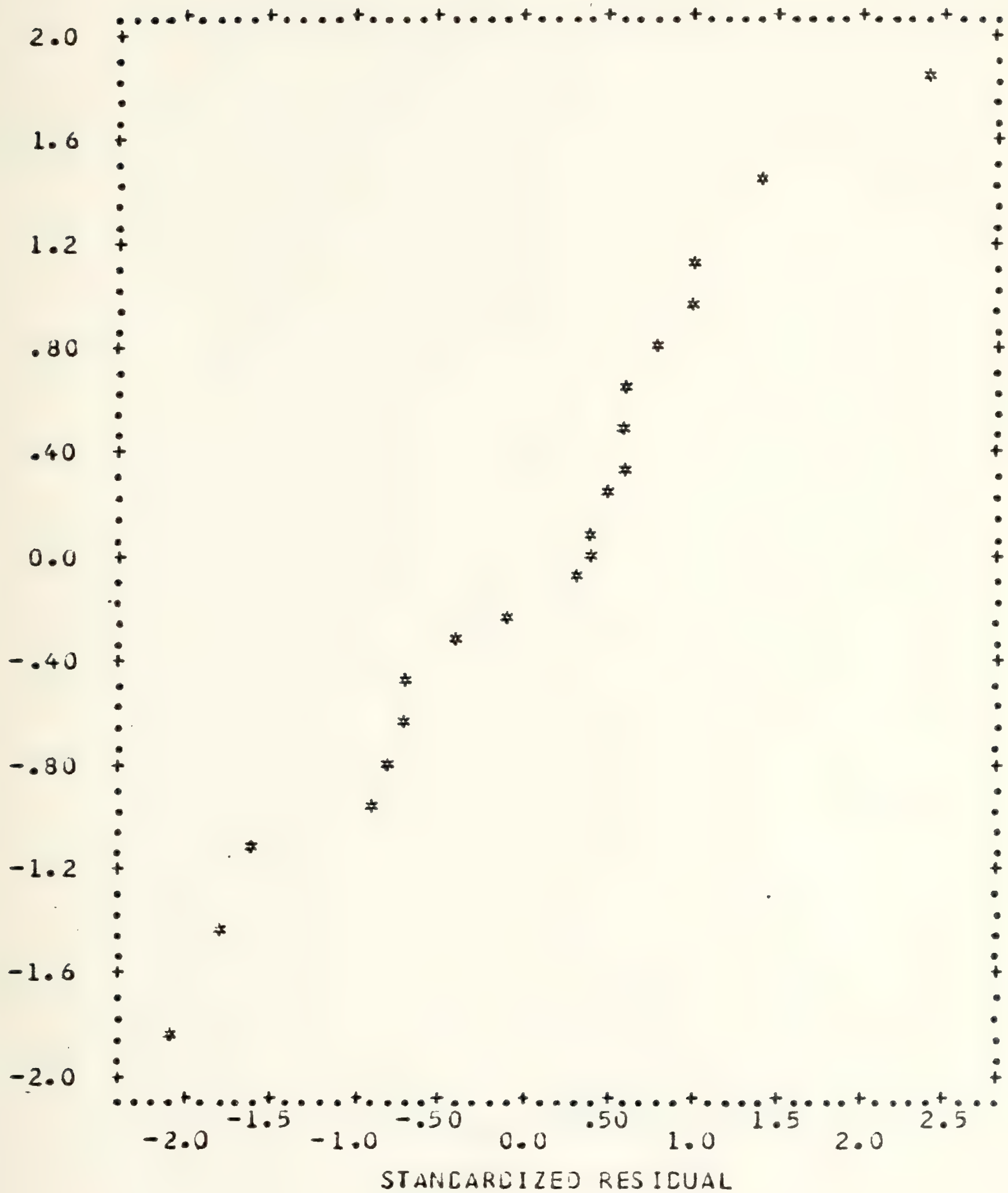
V21--Number of NSN's on Hand Over RO + ERQ



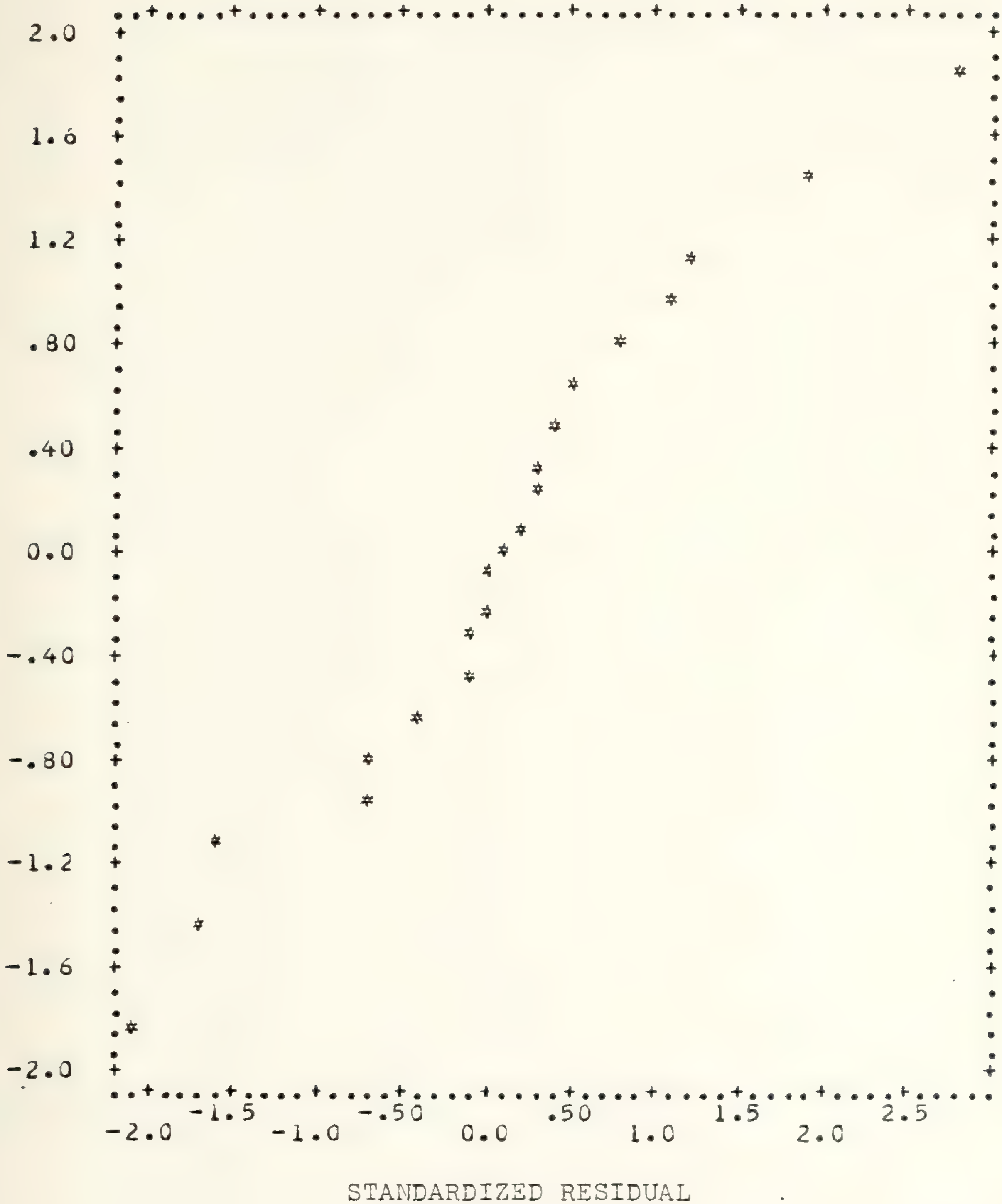
V22--Dollar Value of NSN's on Hand Over RO + ERQ



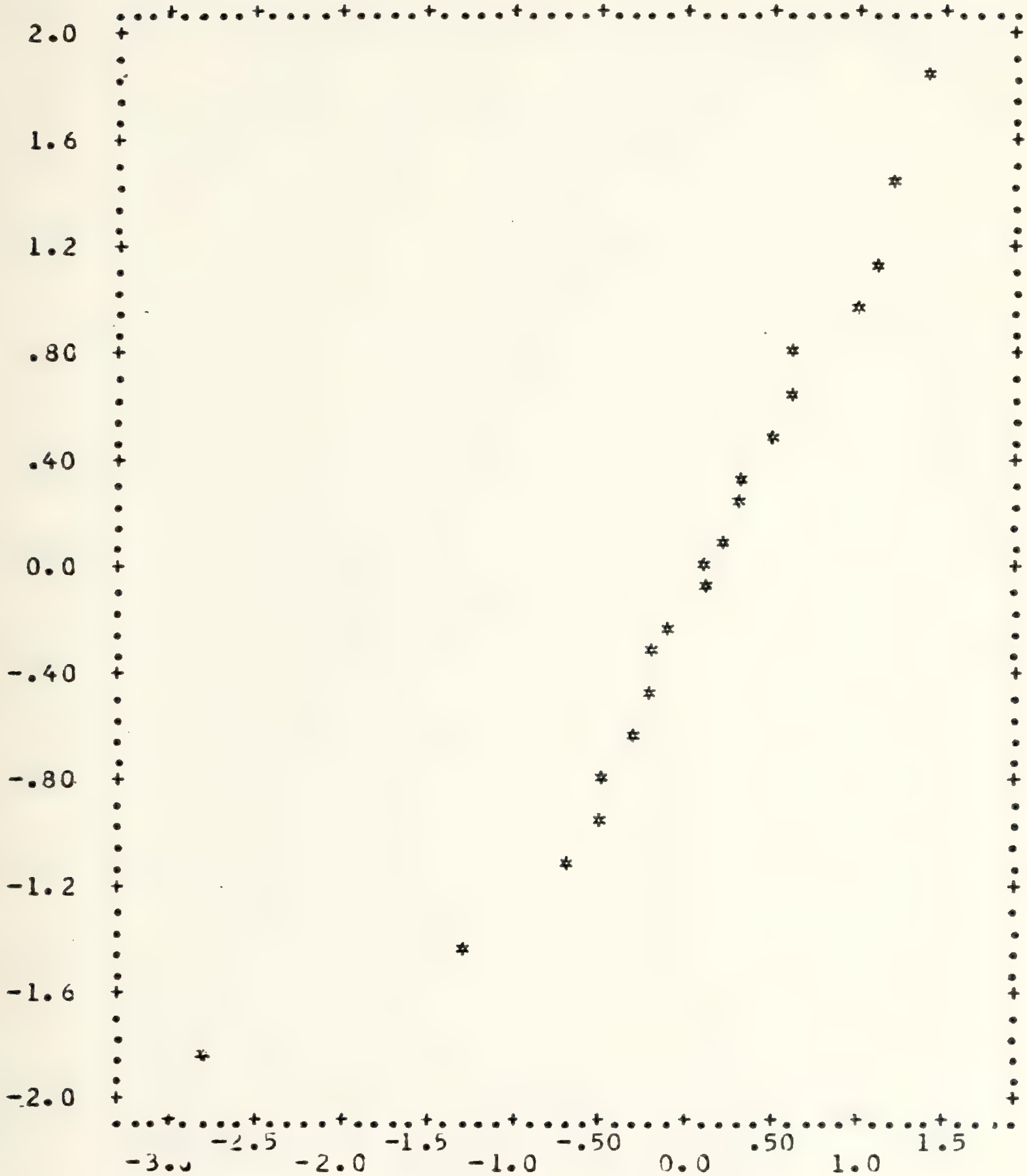
V23--Number of NSN's with 30 Day Usage



V24--Dollar Value of NSN's with 30 Day Usage

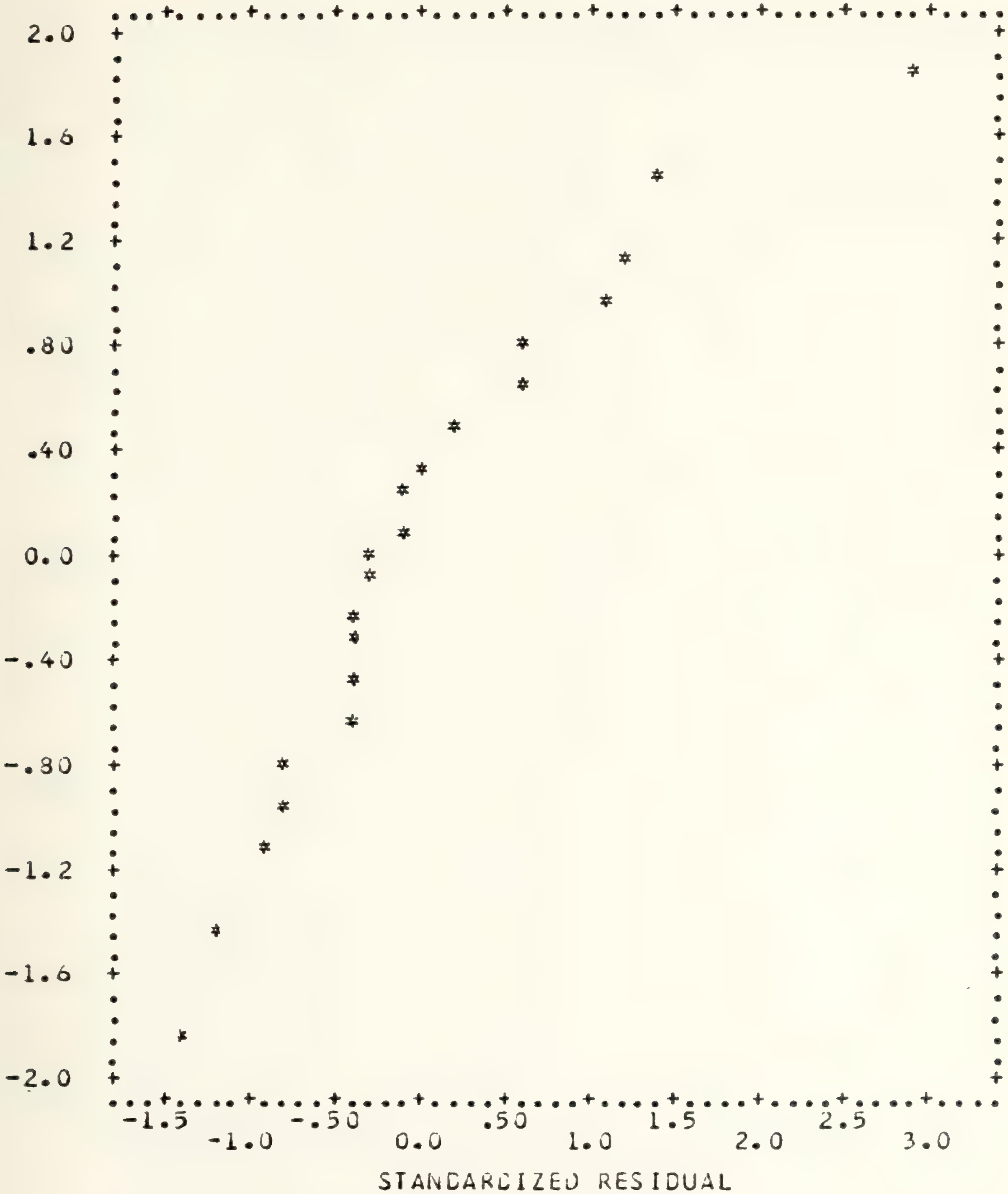


V25--Warehouse Issue Confirms

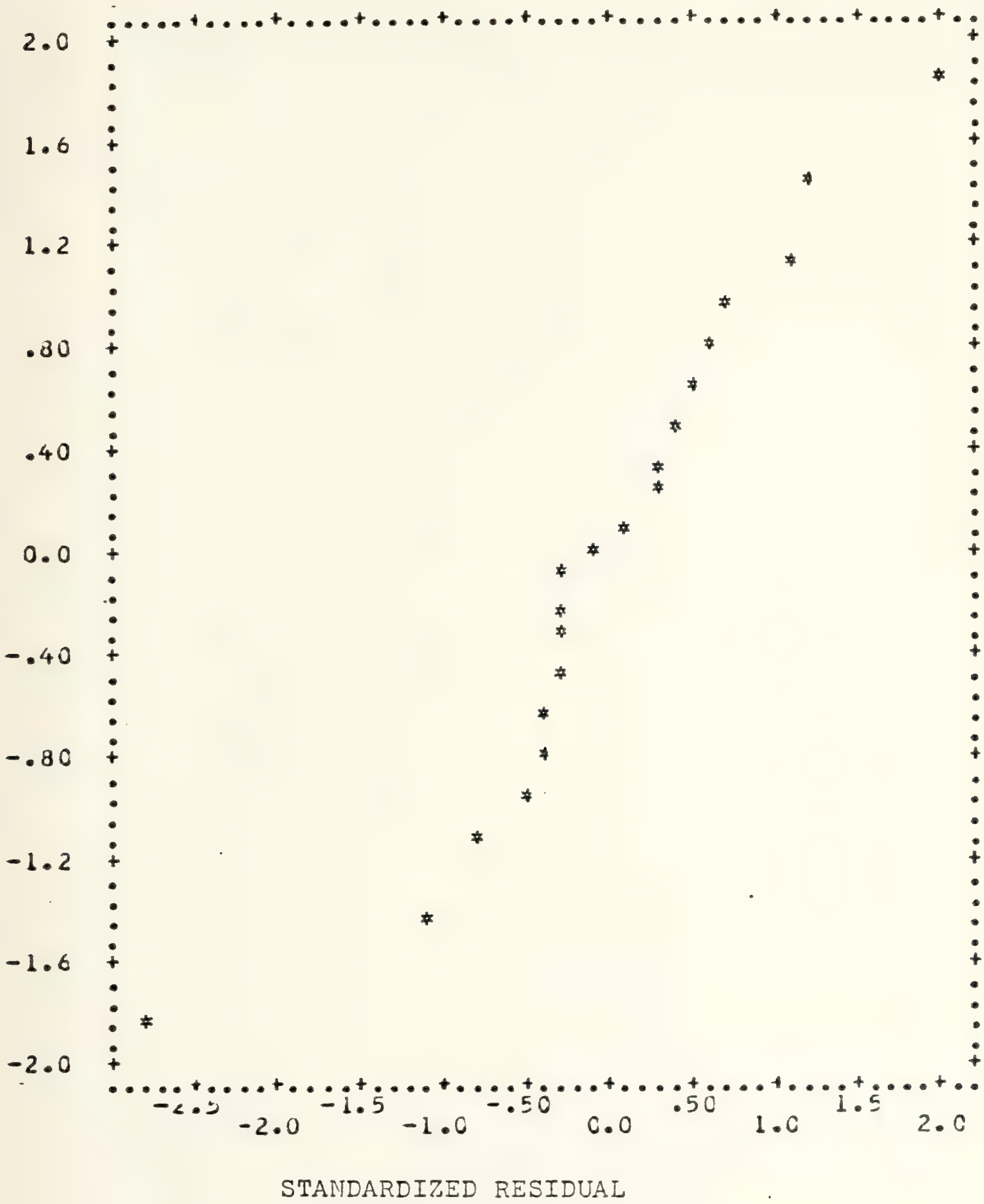


STANDARDIZED RESIDUAL

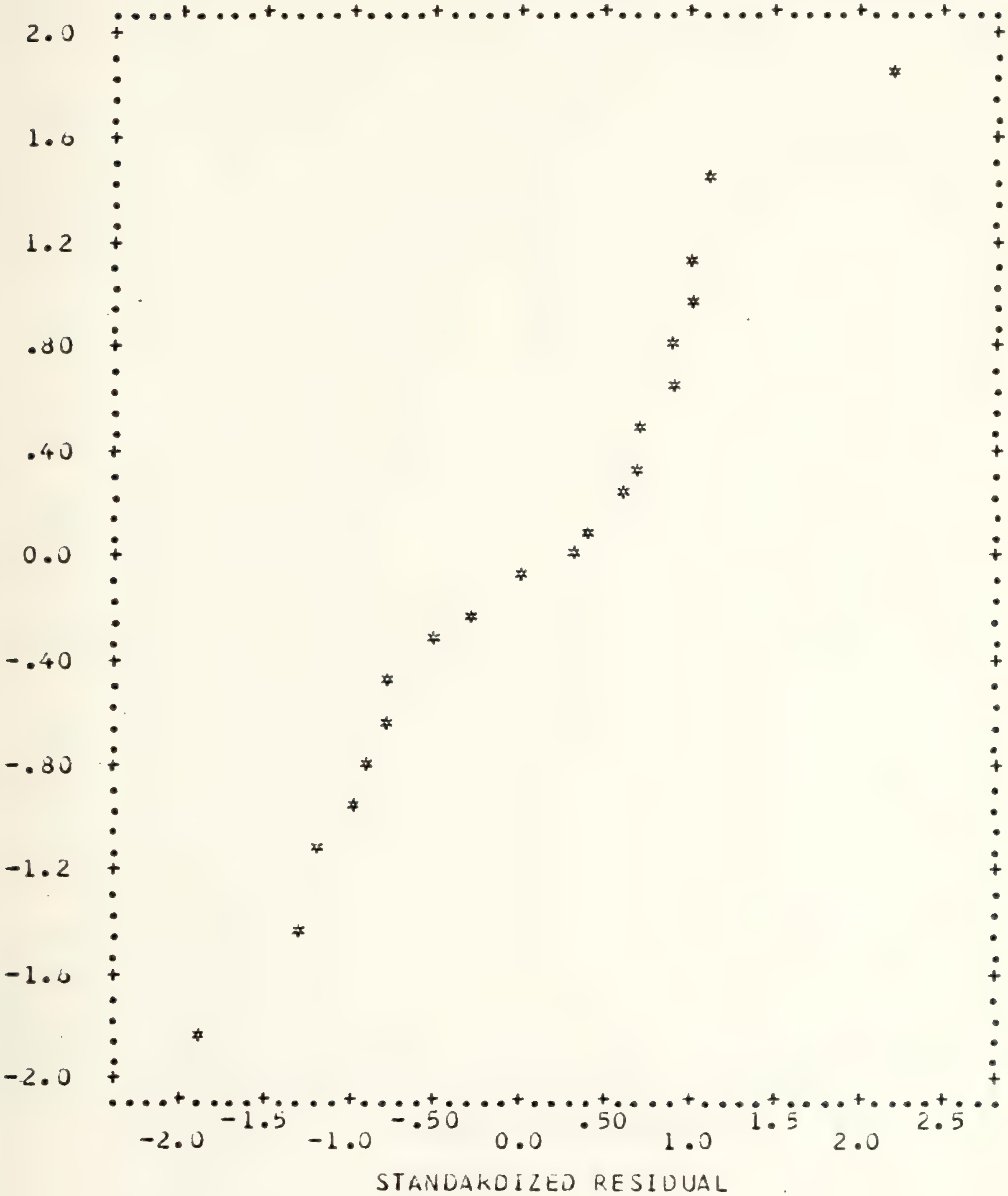
V26--Percent Total NSN's on Hand Which Have an RO



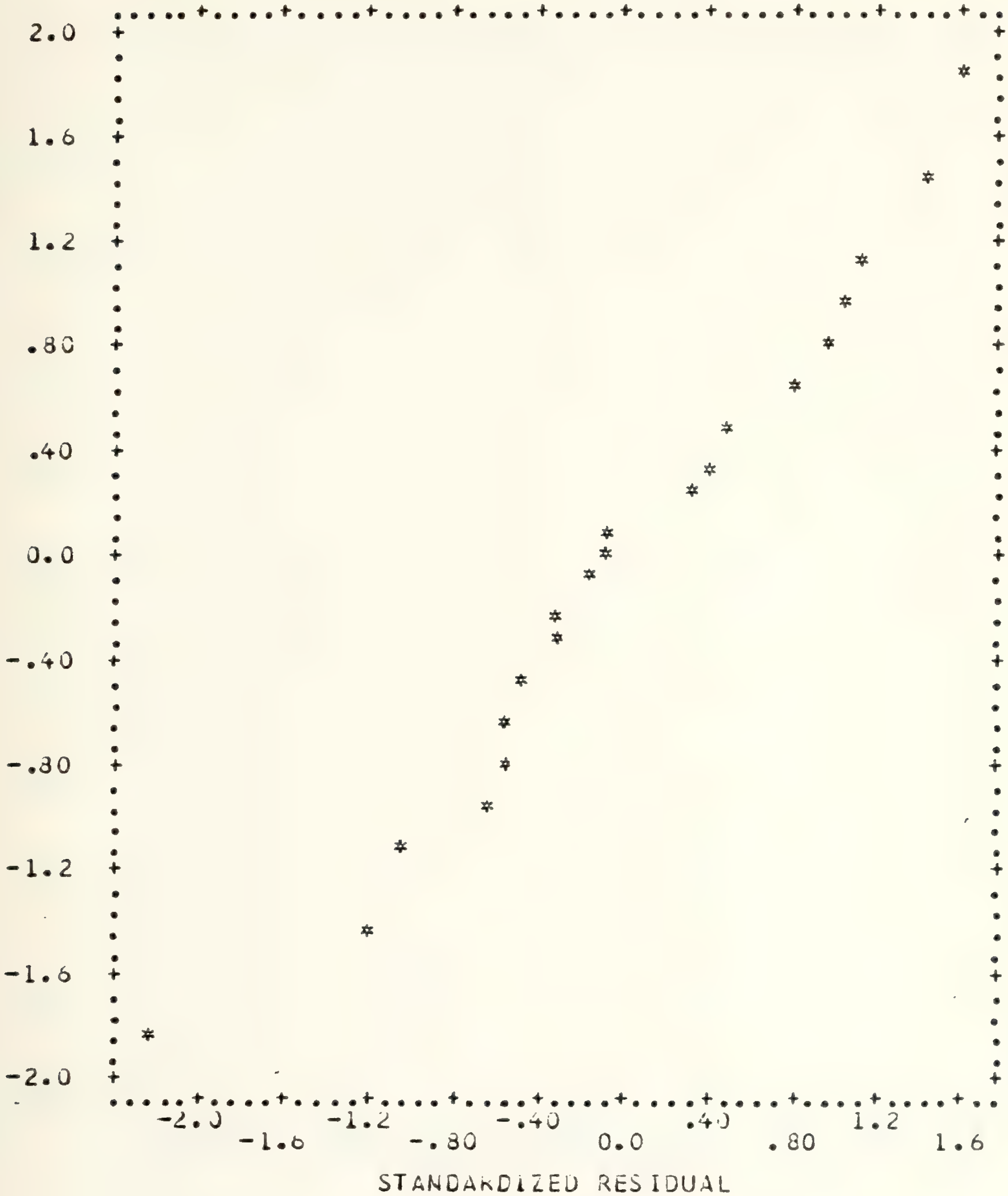
V27--Percent Total Value of NSN's on Hand Which Have an RO



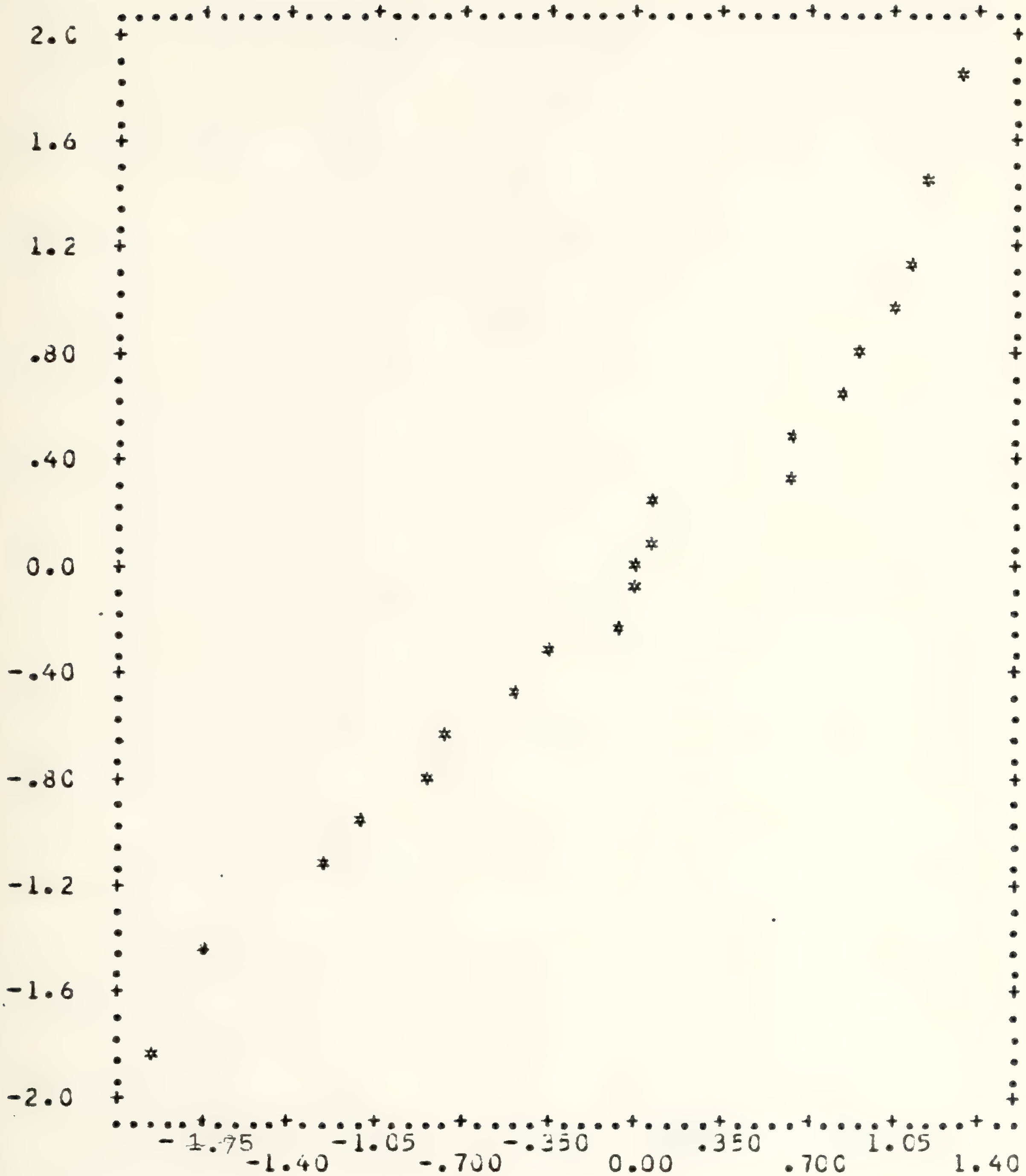
V28--Regular and Hot Item Backorders Released



V29--Regular and Hot Item Backorders Established

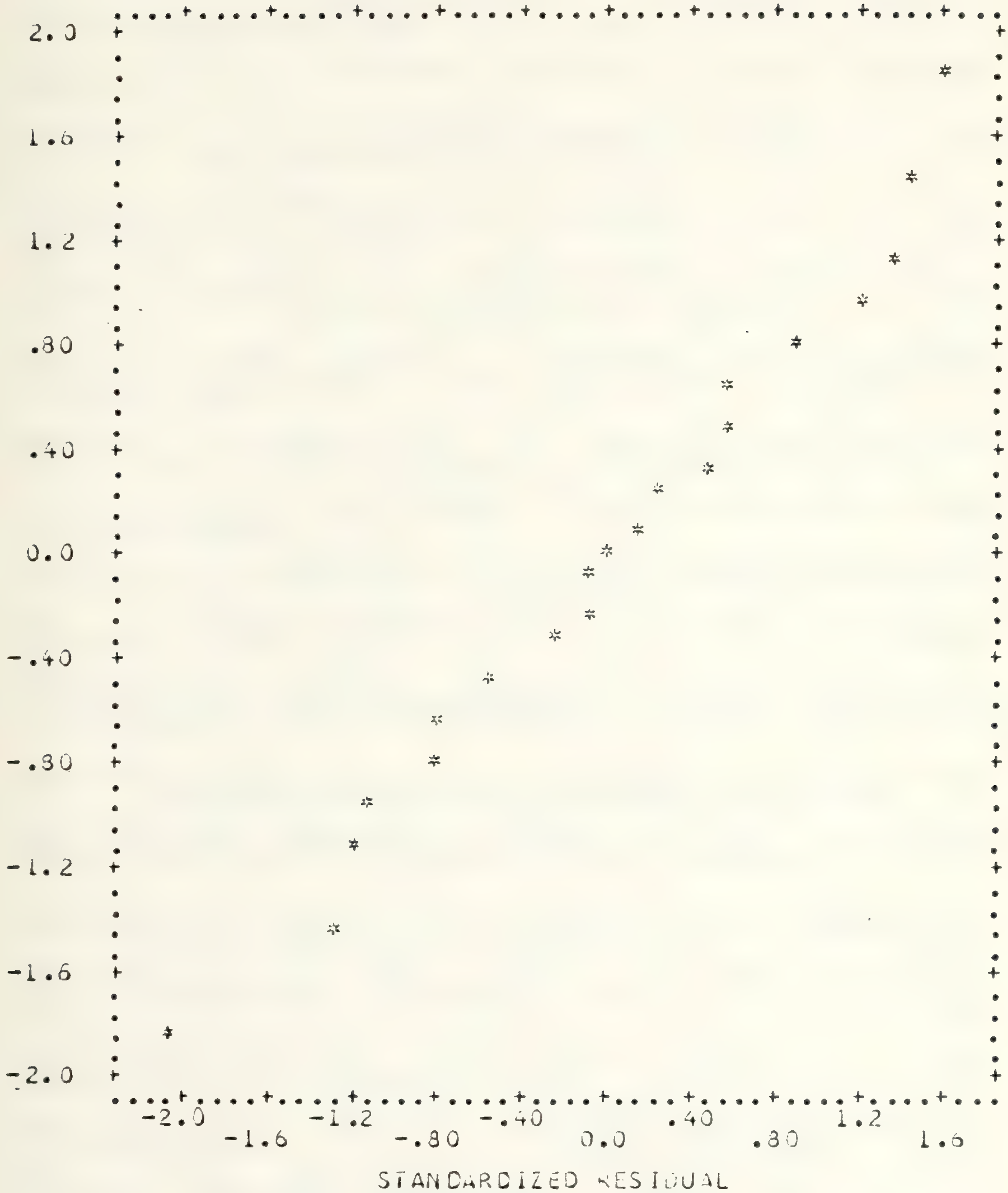


V30--AOA Dollar Value



STANDARDIZED RESIDUAL

V31--A3A Dollar Value



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